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AMERICAN FRUIT GROWER MAGAZINE

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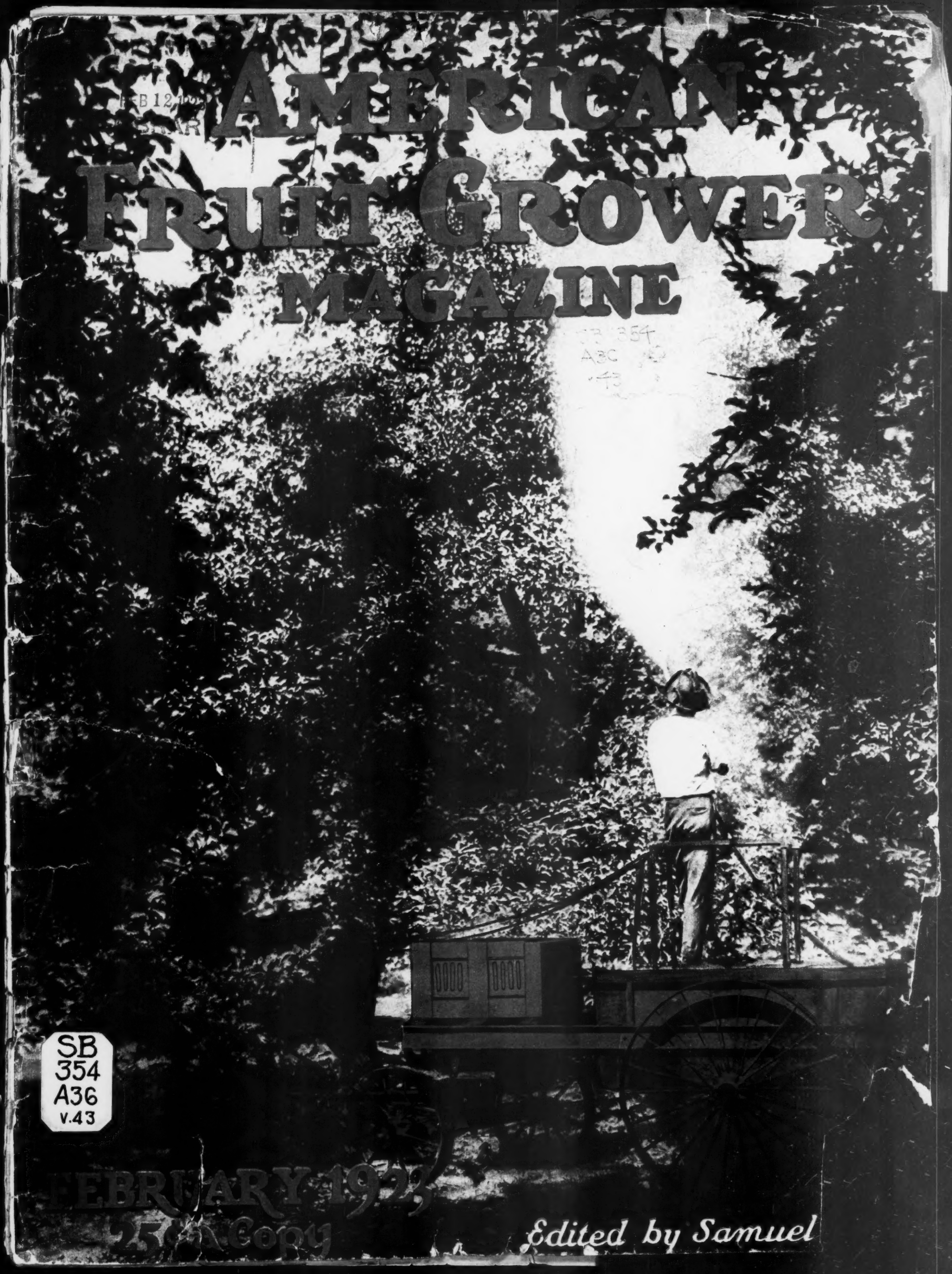

FEBRUARY 1923

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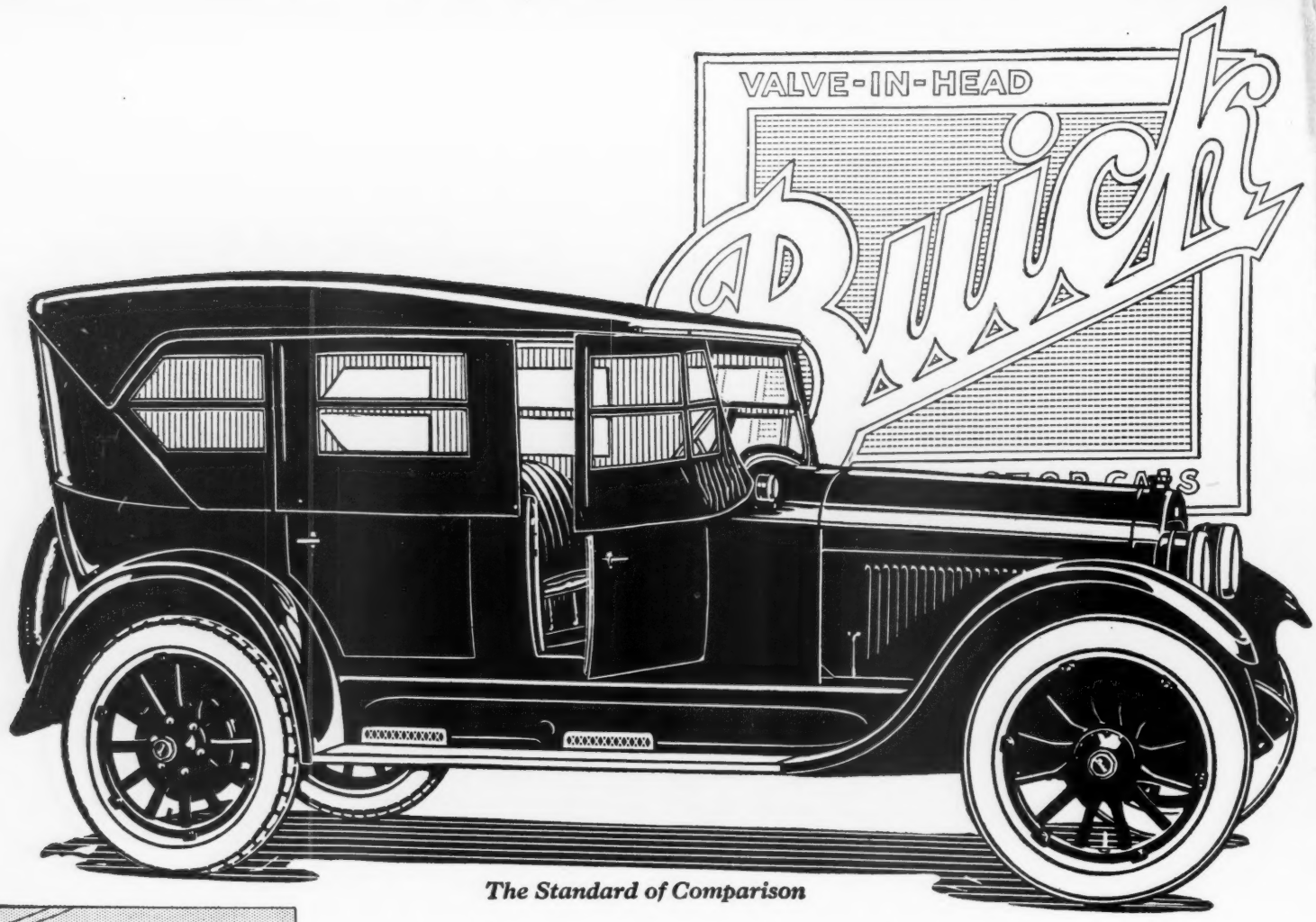
Edited by Samuel



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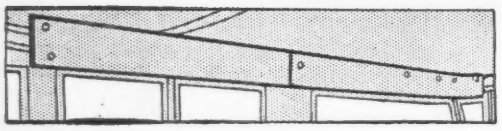

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Important Factors in Good Spraying

By Leroy Childs

Superintendent Hood River Branch, Oregon Experiment Station

THERE are three outstanding requirements which must be recognized by the fruit grower if he is to satisfactorily control his various fruit pests. These three essential requirements are for the most part dependent upon each other in order to bring about control and, therefore, can not be given any preference in discussing them. Proper timing of the different sprays, thoroughness of work and the employment of adequate equipment are these three great essentials. In the case of the last two factors, it is within the powers of the grower himself to employ and carry out these necessary requisites; while in the case of timing of the sprays for best all around results, he is more or less dependent upon advice that he can obtain from the nearest investigators working on these problems.

That many growers do not employ these cardinal principles of pest control is common knowledge to all who are in close touch with fruit production. Occasionally some unforeseen set of conditions arise making control of some of our orchard troubles difficult or even impossible when present known remedial measures are applied under best known conditions.

However, the vast majority of failures in insect and disease control can be definitely traced back to one of the above factors; usually all three of them. Generally speaking, then, the grower who has chronic difficulty in controlling such common pests as the codling moth, leaf roller, apple scab, San Jose scale and the like, is not giving sufficient attention to his methods of application, his timing of the sprays or the efficiency of his spraying equipment.

As has already been mentioned, the only factor that is more or less out of the individual grower's control, is the matter of timing of the sprays. The careful, studious orchardist should, however, after a very few years experience, be able to time these sprays, or find out where this information can be obtained so that the chances of loss resulting from the lack of information on this subject may be reduced to a minimum. The nearest entomologist and plant pathologist should be regularly consulted and the recommendations issued by them, followed as closely as possible. In some parts of the country growers have much difficulty in obtaining this sort of information, due to the fact that no immediate source of reliable information is available. This is the group of growers at considerable distance from their State or Federal Experimental Stations. Fruit growers who are in this group should see to it that their State activities are sufficiently extended as to bring about a closer contact with investigational work of this character. As a rule, however, the programs for spraying that are available to most growers are sufficiently adequate to meet most of their requirements if closely followed.

Timing the Spray

It might be asked, how relatively important is the matter of carefully timing a spray? The range of this importance during different seasons is very variable. Some years it might mean the saving of a large percentage of a crop while during another season it might have little value. This condition of affairs is largely due to different weather conditions which are variable one season with another. Growers then, who do not have available immediate information relative to the behavior of a given insect or plant disease, must then consider their spraying practice as insurance and use a sufficient number of applications to give rather complete protection regardless of seasonal conditions. In so doing, protection can only be obtained during seasons productive of maximum infection. The following of a plan of this sort, naturally is wasteful during some seasons, but as a rule, spray is cheap as compared to ravages that an insect or disease can bring about. To illustrate the point, the control of apple scab may be considered: We have observed that during seasons favorable to the development of the disease, a schedule beginning even as early as the pink spray of lime sulphur and followed regularly during the remainder of the season has not been productive of good control. This was due to the fact that serious primary infection occurred before the application of the pink or cluster bud spray and which, with very favorable weather conditions present, continued to develop regardless of thorough spraying that followed. Continued favorable weather for scab development, that is, prolonged periods of rainfall and wet weather, are not favorable to a regular spraying practice. A condition of this sort results in a general epidemic of scab. We have taken the same set of conditions, starting with the Delayed Dormant spray or a spray applied just as the first leaves are unfolding and have obtained complete control. Under this latter condition, the trees were kept free from infection right from the start and even though weather conditions were decidedly favorable for further infection taking place, the fact that the trees started out the season disease free, prevented any further infection from taking place. The difference in cost for the season's spraying operations was that of one spray while scab infection was reduced in some cases 50% or even more.

Weather Conditions Important

Occasionally exceptional weather conditions arise which make it even difficult for the investigator to give out in advance advice in sufficient time to meet an extraordinary condition. During the past season the Northwest as a whole suffered much loss from Codling Moth ravages. Mr. E. J. Newcomer, Federal Entomologist, located at Yakima, Washington, points out that this condition was largely due to an abnormally warm June, the hottest that has been recorded there in 30 years. Under conditions of this sort, Codling Moth activities are greatly increased and the number of eggs deposited are much more numerous. Under this set of conditions our regular recommended spray schedule was not adequate to give good control. The spray should have been applied at closer intervals during the early part of the summer.

Thorough Work Necessary

Too much emphasis can not be given the matter of thorough work. All of the spraying advice and recommendations in the world will not save the fruit grower if he fails to recognize this important phase of spraying. A very high percentage of our fruit growers are very careless in their methods of applying sprays. Many growers think that they are through when in reality they are not; as a rule these men can not be told or at least will not accept the accusation, and learn to improve their methods only through the disagreeable experiences of many losses resulting from the failure to control their various orchard pests.

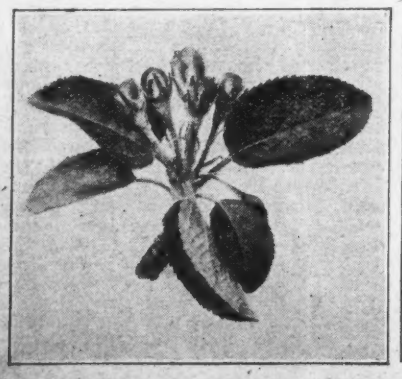
Thoroughness of application depends to a large extent, upon spraying equipment, and for the most part it is due to this lack of spraying facilities that brings about the chronic condition of an over-abundance of diseased fruit in some sections of the country. Many growers have failed to recognize the fact that as their orchards become older, a very decided need for sprayer improvement occurs. Sprayers also wear out or become so inefficient that thorough work becomes almost an impossibility.

The Spray Gun

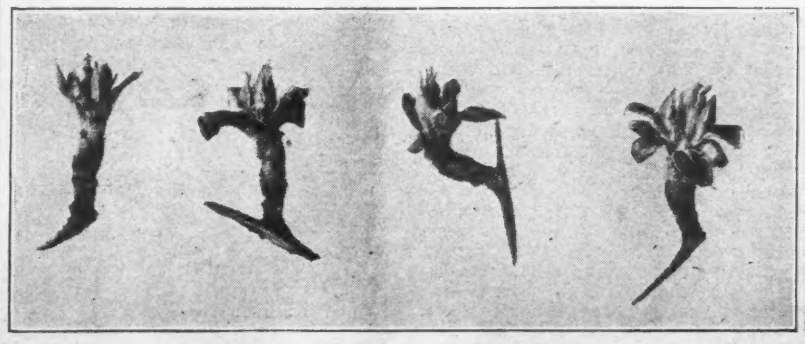
With the appearance of the spray gun has come much ineffective spraying. Not because the spray gun is a failure, but because growers have tried to use it on all types of sprayers.

Based upon our experimental work we can state emphatically and without reservation, that the gun can not be used on every spray outfit. The dissatisfaction existing among growers today is probably due largely to the fact that these growers have tried to use their guns under all sorts of conditions. It appeals to them because of the ease of operation and the speed with which spraying can be accomplished. In fact, many have followed the lines of least resistance, have used the gun, disregarding entirely the fundamental principles that must be present, that is, a finely divided spray driven at high pressure and with considerable volume in order to obtain the benefits that this instrument offers. For example, in looking over the results obtained at the Hood River Station in controlling the Codling Moth, we find that the gun operated on a 1½ horse power outfit, has been very poor. Our analyses of these results, obtained on trees so sprayed, show that fair control was obtained in

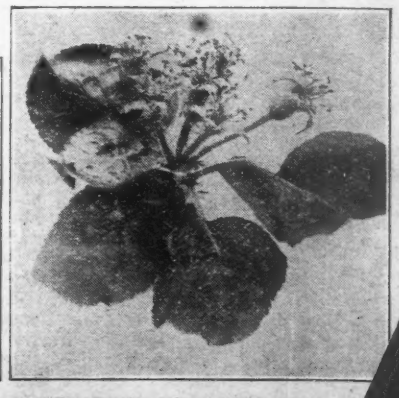
(*Continued on page 19*)



Ready for the pink spray



Various stages of the delayed dormant



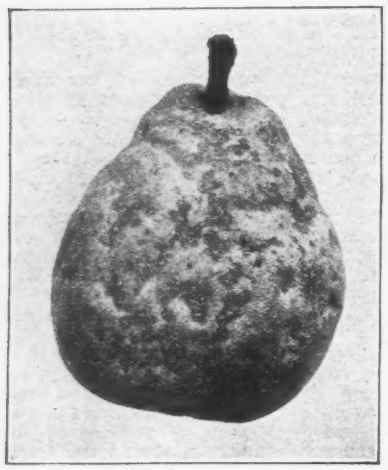
Ready for the calyx spray.

Some Important Sucking Insects

By James B. Palmer

Cornell University

ACCORDING to reports from many of the fruit belts of the country San Jose Scale is again on the increase. For many years this pest has been one of the most important insects injuring fruit, infesting as it does such a large number of deciduous fruit and ornamental trees and shrubs. For the past few years growers have felt that this scale was thoroughly under control and now it is apparently becoming more abundant in spite of the control measures that are practiced. A summary of the possible causes of this increase with added precautions for the destruction of this cosmopolitan pest is quite proper and opportune.

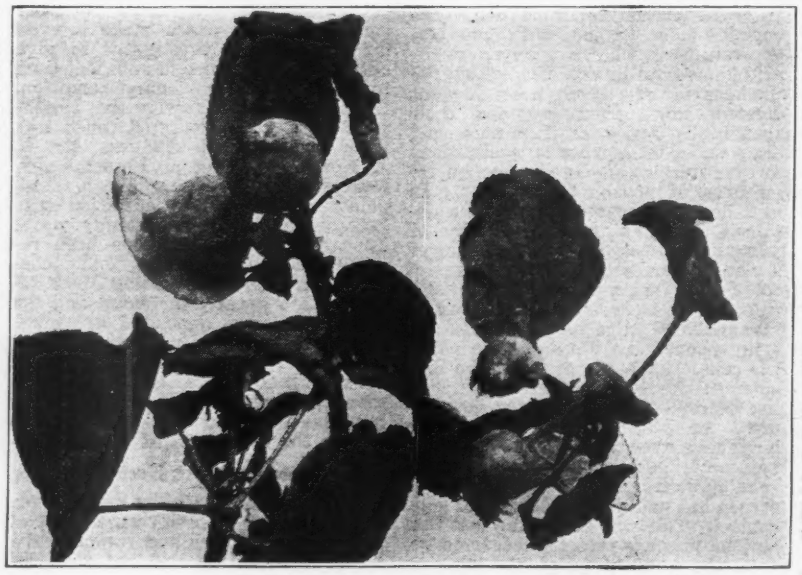


San Jose scale on pear

San Jose Scale was introduced from China into California about 1870, becoming established at San Jose from which it derives its name. In 1880 Professor J. H. Comstock of Cornell University described it and named it *Aspidiotus perniciosus* because of its pernicious habits and great capacity for injury to plants. It spread rapidly over the states west of the Rocky Mountains and in 1886 or 1887 became established in eastern nurseries. It spread so rapidly that by 1905 it had infested practically all the fruit sections of North America within its climatic range. Since that time it has maintained its position as an insect of greatest economic importance. San Jose Scale has become widespread in a relatively short time, because of its ability to infest such a large number of host plants, its inconspicuous appearance, its distribution on nursery stock and also to its enormous fecundity. In the early stages of infestation it is inconspicuous and so may easily pass unnoticed, but in two or three years' time it will spread over entire trees and cause their death. This is not surprising since a single female scale may rise to over one billion female scales in one season where four generations are produced. Of course all these scales do not survive, but under favorable conditions the majority reach maturity and in turn reproduce at the same rate.

This pest attacks all parts of the host plant, infesting the trunks, limbs, leaves and fruit. The scales lie so close together when they have become abundant that they overlap each other and completely cover the host with a characteristic grayish, somewhat roughened scurfy deposit. As a rule reddish discolorations of the bark or skin of the fruit surround the individual scales. This feature is particularly characteristic of the insect and renders it easy to distinguish. The fruits commonly infested are apple, pear, plum, quince, peach, prune, apricot, nectarine, sweet cherry, currant and gooseberry. In addition many deciduous ornamental trees and shrubs may be seriously infested. Because of its very small size and inconspicuous appearance on the bark has been widely distributed on nursery stock. This is the only way that this pest could become established in such a short time in all the fruit growing areas of North America. After having once been established in a given locality, birds, wind and other insects feature in its dissemination from tree to tree and orchard to orchard.

The individual female scales when full grown are about the size of a pin head. They are circular in form and gray in color with a central dark nipple surrounded by a yellowish ring. The male scales are elongate oval in shape and are about half as large as the mature female scales. They also have a dark circular raised spot which is located near one end. The younger scales are nearly black in color with a small dark dot in the center, surrounded by a blackish ring. It is these small, black, halfgrown scales that live thru the winter. In the spring the males emerge from under the waxy scale in a winged stage. The halfgrown female scales mature and begin to give birth to living young, continuing to produce young for a period of nearly six weeks. The newly born insect is a minute, pale yellow creature which crawls from under the mother scale and moves about for a few hours. It soon works its long, bristlelike sucking beak thru the bark and folds its legs and antennae beneath its body. At about the time the insect becomes stationary it begins to secrete waxy filaments which mat into a grayish scale. This scale becomes larger and darker, finally resulting in the characteristic mature scales. About 25 days after birth the males emerge as delicate two-winged fly-like insects. The females become full grown in 30 days and begin to produce larvae in three or four days. From three to four generations are produced in a season, depending on the particular locality and climate.



Aphis deformed fruit

Scale Becoming Aggressive

In the past two years reports have come from many of the Middle Atlantic and East Central states declaring that the San Jose Scale has become aggressive after several years of comparatively effective control. This may be due in part to the reduction of the numerous natural enemies. It may be that the increase and abundance of San Jose Scale is due in part to more scales surviving the winter. On the other hand it is entirely possible that the natural methods of control have become as lax as have the artificial. This is without question the correct explanation in certain localities in certain seasons. There has been a tendency on the part of growers and spray operators as well, to let up on the control methods. The fact that the scale has been almost exterminated in many orchards has caused the growers to give up the strong lime-sulfur sprays. This policy was adopted in part, because it was desirable in war times to cut down expenses. Such action was indeed warranted at that time but now the concentrated solutions must again be applied. The general adoption of the delayed dormant spray has also had an effect. In the case of large orchards, growers frequently are unable to go over the whole orchard before the buds have developed to the stage where there is danger of burning the new foliage, consequently part of the orchard fails to receive the spring spray which will control scale. Perhaps none of these causes have been serious enough to explain the present increase, but altogether they, no doubt, explain the situation.

Methods of Control

Many methods of control have been devised and tried out with the result that several have showed their outstanding value. Miscible oils have been quite effective in many cases and are still widely used. As a dormant spray, they should not be diluted to more than one gallon of oil to ten and one-half gallons of water to get satisfactory results. This material has, however, been blamed in some cases with considerable injury to fruit trees, peaches especially. Lime-sulfur wash has withstood the severest tests of scientific experts and practical orchardists. At the present time it is perhaps the cheapest and safest method of control. Its popularity is due in part to the fact that it is also an effective fungicide. Badly infested trees should be sprayed with lime-sulfur solution testing 4 degrees Baume in the tank, The commercial concentrate should be diluted at the rate of one gallon of lime-sulfur to eight gallons of water. Some growers, however, make up their own solution obtaining different degrees of concentration at different times. The following table published by the Geneva Experiment Station will give the rate of dilution for the home made solution:

Concentrate testing (degrees Baume)	Dilution for San Jose scale	Dilution for apple (summer spray)
35	1 to 8¾	1 to 43½
34	1 to 8¼	1 to 42½
33	1 to 8	1 to 41
32	1 to 7½	1 to 40
31	1 to 7¼	1 to 39
30	1 to 6¾	1 to 37½
29	1 to 6½	1 to 36
28	1 to 6	1 to 35
27	1 to 5¾	1 to 33½
26	1 to 5¼	1 to 32½
25	1 to 5	1 to 31

In badly infested plantings two applications should be made; one in late autumn after the leaves have fallen and another in early spring before growth begins, taking care always to spray only when the temperature is above freezing. Some growers feel that the spray gun is conducive to poor results and have therefore adopted the familiar rod and nozzle again. This, however, depends largely on the operator. Satisfactory results may be obtained with either if the proper care is taken. The trees should be sprayed from both sides so that all twigs and branches may

Young aphis and predacious insect eggs

be thoroly covered with the lime-sulfur wash. To do effective work, it is necessary to have a good engine and a powerful pump which will carry 200 pounds pressure per square foot or more depending on the number of nozzles used. By obtaining a high pressure a fine driving mist will be obtained so that the tree will be literally enveloped in a fog of lime-sulfur. A little breeze may increase the effectiveness of the application, but spraying in a strong wind is quite undesirable. The thoroness of the application and hence the satisfactory control of the scale is largely dependant upon the operator. An experienced and determined man applying the spray, will, without question, obtain good results.

The Apple Aphids

There are four kinds of aphids which commonly attack apple trees; the green, rosy, grain and woolly aphids. Of these only the first two are discussed in this article, since they are by far the most important. It is quite possible that the injury due to the green and rosy aphids over a period of years approaches the damage caused by the codling moth and San Jose Scale. The loss may vary greatly from year to year, being relatively small one season and unusually large and serious another.

Both the green and rosy aphids spend the winter in the egg stage. The hibernating black eggs are very common and abundant on the twigs of apple trees in the winter. When the buds break in the spring, the eggs hatch and the young aphids migrate at once to the small green tips of the opening buds where they begin at once to feed and grow. In a relatively short time, generally in about two weeks, these stem mothers begin to produce living young. These mature aphids may give birth to an average of six lice per day. From this time on, the life history of the two aphids is essentially different.

The Green Aphis

Aphis pomi, the green aphid, lives on the apple trees all summer, producing some fifteen generations. The second generation consists of over 75% of winged females which disseminate

Spray Calendar for Pennsylvania

by F. N. Fagan, Pennsylvania State College

APPLES

Time	Materials for 200 Gallons of Spray	For Following Diseases and Insects.
TREES DORMANT or DELAYED DORMANT Leaves of first buds showing about ¼ inch.	Lime-sulphur testing out of sprayer 1.0. Sp. Gr.	San Jose Scale
	Lime-sulphur testing out of sprayer 1.03 Sp. Gr. Tobacco Extract (40% Nicotine) 1 qt. Powder Arsenate of Lead 6 pounds.	San Jose, Oyster or Scurfy Scales. Aphis Bud moth, Leaf-rollers and other eating insects.
Pink. When flower cluster buds are separating.	Lime-sulphur testing out of sprayer 1.008 Sp. Gr. Tobacco Extract (40% Nicotine) 1 qt. Powder Arsenate of Lead 6 pounds.	Apple Scab, Frog-eye, Mildew. Aphis—any early Red bug Bud moths—Leaf-rollers, Curculio.
Petal Fall. When petals have nearly all fallen from flowers.	Lime-sulphur testing 1.008 Sp. Gr. Tobacco Extract (40% Nicotine) 1 qt. Powder Arsenate of Lead 6 pounds.	Scab, Frog-eye, Mildew. Aphis, Red bug if not under control. Codling moth, Curculio and any other eating insects.
Two weeks after petal fall spray. Apples well formed.	Repeat Petal Fall spray. Substitute Bordeaux mixture for Lime-sulphur in sections where Apple Blotch and Bitter Rot are pests.	Apple Scab, Frog-eye, Apple Blotch. Codling moth, Maggot, Aphis, Red bug.
*Extra Spray. For use in sections infested with Apple Blotch and Bitter Rot. Four weeks after Petal Fall spray.	Bordeaux Mixture, 16-16-200. (If eating insects are not under control use 6 lbs. Powder Arsenate of Lead). (If Aphis not under control use Nicotine in this spray same as in Petal Fall spray.)	Blotch and Bitter rot. Codling moth.
Mid-Summer Spray Late July or early Aug. depending upon season. Time it for second brood codling moth.	Repeat Petal Fall spray. Nicotine not necessary unless Aphis are not under control. Substitute Bordeaux Mixture for the Lime-sulphur in sections where Blotch and Bitter Rot are found as pests.	Late infection scab. Fruit spot. Sooty and Fly speck fungus, Bitter rot. Codling moth, and other eating insects.

In sections where Lime-sulphur solution burns foliage and fruit Self-boiled Lime-sulphur can be substituted.

CHERRIES

DORMANT	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose, Forbes, Putman scales.
	Miscible oil sprays as recommended by the manufacturer.	Lecanium and related scales.
*Extra spray. When first new leaves show Aphis present.	Tobacco Extract (40% Nicotine) 1 qt. and 4 to 6 pounds of soap in solution.	Aphis.
Petal Fall After petals have fallen.	Self-boiled Lime-sulphur 32-32-200. Powder Arsenate of Lead 6 pounds.	Brown rot, Leaf spot, Mildew. Curculio.
When calyx shucks are off the green fruit.	Self-boiled Lime-sulphur, 32-32-200. Powder Arsenate of Lead, 6 pounds.	Brown rot, Leaf spot, Mildew. Curculio.
*Just before fruit turns color.	Self-boiled Lime-sulphur. Powder Arsenate of Lead, 6 pounds.	Brown rot, Leaf spot, Mildew. Fruit fly, early slugs.
Late summer foliage spray. After fruit is harvested.	Self-boiled Lime-sulphur. Powder Arsenate of Lead, 6 lbs.	Leaf Spot. Cherry Leaf slug.

*This spray may often be omitted.

GRAPES

When new shoots are 6 to 14 inches long. Before flower buds open.	Bordeaux mixture, 16-16-200. Powder Arsenate of Lead 6 lbs.	Mildew Anthracnose. Black Rot Flea beetles—early Rose chafer.
Just after flower buds have bloomed and young fruit set.	Bordeaux mixture, 16-16-200. Powder Arsenate of Lead 6 lbs.	Mildews Anthracnose Black Rot Flea beetles, Root worm, Rose chafer, Berry moth.
Ten days to 2 weeks later.	Bordeaux mixture, 16-16-200. Powder Arsenate of Lead 6 lbs. (If any leaf hoppers present in nymph stage add 1 qt. of 40 % Nicotine).	Mildews. Rots Any eating insects
Two weeks later.	Bordeaux mixture, 16-16-200. (If eating insects not under control add Powder Arsenate of Lead 6 lbs.) (If leaf hopper nymphs are present add 1 qt. of 40% Nicotine.)	Rots Mildews

*Special Leaf Hopper Spray.—This insect often becomes a serious pest. It can be controlled by spraying when the hoppers are in the nymph stage by using 1 qt. of 40% Nicotine in combination with the above sprays, or by special sprays using the nicotine with 4 to 6 pounds of soap in solution.

PEACHES

Time	Materials for 200 Gallons of Spray.	For Following Diseases and Insects.
DORMANT Before buds swell at all.	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose Scale Peach Leaf Curl
*Special DORMANT For lecanium and related scale insects.	Miscible oil such as "Scalecide." Strength as recommended by the manufacturer.	Lecanium and related scale insects
When little peaches are pushing out of calyx shucks. Shucks may be dropping.	Self-boiled Lime-sulphur, 32-32-200. Powder Arsenate of Lead 6 lbs.	Peach scab Brown Rot Curculio
Three weeks later.	Repeat last spray.	Peach Scab Brown Rot Curculio
Three to four weeks before fruit ripens.	Self-boiled Lime-sulphur, 32-32-200.	Brown Rot

PEARS

DORMANT	Lime-sulphur testing 1.03 Sp. Gr.	San Jose Scale
Pink or Flower bud. When flower buds separate in cluster.	Lime-sulphur to test 1.008 Sp. Gr. Tobacco extract (40% Nicotine) 1 qt. Powder Arsenate of Lead 6 lbs.	Scab, Leaf Spot, Black Spot, Black Rot Psylla, Aphis. Any eating insects.
Petal Fall After petals have fallen.	Lime-sulphur to test 1.008 Sp. Gr. Tobacco extract (40% Nicotine) 1 qt. Powder Arsenate of Lead 6 lbs.	Scab, Leaf Spot, Black Spot, Black Rot Psylla, Aphis Codling Moth, early slugs
Fruit Cluster spray, about 2 weeks after petal fall When young fruits stand in open cluster.	Lime-sulphur to test 1.008 Sp. Gr. Powder Arsenate of Lead 6 lbs.	Scab, Leaf Spot, Black Spot, Black Rot Codling Moth, slugs.

Special Sprays Needed to Fight Pear Psylla. Nicotine 1 qt. to 200 gallons and 4 to 6 pounds of soap in summer months to kill nymphs. Miscible oil sprays as recommended by manufacturers on warm days in late winter will aid by killing adults.

PLUMS

DORMANT	Lime-sulphur to test 1.03 Sp. Gr. out of sprayer.	San Jose Scale
	Miscible oil sprays as recommended by the manufacturers.	Lecanium and related scales.
When little plums are pushing out of Calyx shucks. Shucks may be dropping	Self-boiled Lime-sulphur, 32-32-200. Powder Arsenate of Lead 6 lbs. (Tobacco extract (40% Nicotine) should be used if aphis are present.)	Brown Rot, Leaf Spot, Mildews. Curculio
Two weeks later	Self-boiled Lime-sulphur, 32-32-200. Powder Arsenate of Lead 6 lbs.	Leaf Spot, Brown Rot, Mildews. Curculio
Fruit Spray Two to three weeks before harvest	Self-boiled Lime-sulphur.	Brown Rot, Leaf Spot, Mildews.

*Bordeaux mixture 16-16-200 can be used in place of Self-boiled Lime-sulphur on European varieties. Self-boiled Lime-sulphur is more safe on Japanese varieties.

SPRAY CALENDAR

1. To secure the specific gravity of Lime-sulphur as recommended in this calendar. Test the concentrated Lime-sulphur solution with a specific gravity hydrometer. Divide the decimal part of the concentrate reading by the decimal of the desired spray. The result shows the total dilution required. Example, concentrate testing 1.27 sp. gr. and desired spray is 1.03 sp. gr., dividing .27 by .03 gives 9. Nine is the total dilution required; thus one would use 1 gallon of a concentrate testing 1.27 sp. gr. and 8 gallons of water to get a spray testing 1.03 sp. gr.

2. Know what pests you are trying to control.

3. Know you are using the right materials, applying it at the right time and doing a complete job of spraying.

4. Be sure your sprayer engine has power enough to give you good pressure. 250 pounds is not too much pressure if using spray gun. More will do no harm.

5. If using spray gun do not shoot direct with the solid spray.

6. In making Bordeaux Mixture have both the lime solution and the copper sulphate solution in their full dilutions before mixing them. Place one solution in sprayer start the engine and then add the other solution.

7. In making self-boiled lime and sulphur, slack lime slowly, when partly slacked add sulphur, allow to heat until brown streaks appear slightly and then stop cooking by adding rest of cold water.

NOTE by Managing Editor—This calendar is of special interest to growers in New York, New Jersey, Michigan and Pennsylvania.

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the pest to different parts of the same tree, to other trees and no doubt to neighboring orchards. All the lice are females which produce live young without mating except the 14th or 15th generation. Those in the 14th or 15th generation are wingless males and females. After mating, these females deposit the black eggs which survive the winter.

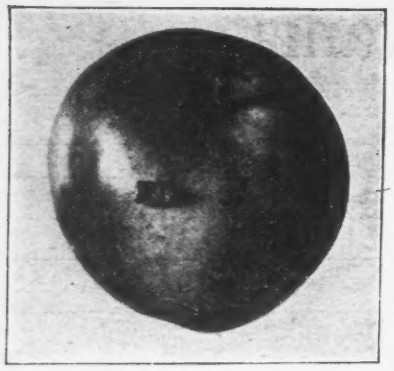
The Rosy Aphis

The rosy aphid, on the other hand, migrates from the apple trees to the narrow-leaved plantain in its fourth generation early in June. In spite of this fact, however, the rosy aphid inflicts very serious injury on apple trees often reducing marketable fruit more than half on badly infested trees. The mature stem mothers developing from the overwintering eggs are more or less purplish in color and are covered with a whitish powder. In this respect, they may be easily distinguished from the yellowish green to dark green of aphis pomi and the grain aphis. The third generation of females produces in part winged progeny which fly from the apple trees to the narrow-leaved plantain and spend the summer passing thru the usual wingless female generations. As a rule the majority of the rosy aphids leave the apple trees in the third or fourth generations. During the latter part of September and most of October, winged females are developing on the plantain. These return to the apple and give rise to the egg-laying females. After mating with winged migrating males, these females deposit the eggs which carry the pest thru the winter.

On nursery stock, the aphids may cause a very bad curling of the leaves and may decidedly check and stunt the current season's twig growth. In large bearing orchards, the young fruits may be attacked by incredible numbers of these lice, preventing the full development of the fruit and leaving often more than half the apples knotty, dwarfed and deformed. The characteristic clusters of small stunted "aphis apples" are familiar to most apple growers.

Effective Control

The most effective time to spray for aphis is at the delayed dormant stage when the newly hatched lice are clustered on the opening buds. It should not be understood that one application alone gives good control, but as a rule this one application does a great deal to prevent a serious summer infestation. Three-fourths of a pint of nicotine sulfate solution (40% nicotine) should be added to one hundred gallons of the delayed dormant spray. Where scale, leaf rollers or case bearers are also to be controlled, the formula should be ¾ pint of nicotine sulfate, 11 gallons of lime-sulfur (testing 32 degrees Baume), arsenate of lead, 5 pounds of paste or 2½ pounds of powder and 100 gallons of water. Special pains must be taken to cover every bud, using a high pressure and throwing out a fine driving mist. It is not advisable to spray in a strong wind and even in a light breeze results may be rather unsatisfactory. This is due to the fact that the aphis crawl around to the leeward side of the bud to escape the chill wind and thus escape the spray also. After the buds have developed more than one-half inch of green tips, the lice get down in the young leaves so that they may easily escape the spray. Even tho only a few aphis live thru the first two weeks, escaping death in the delayed dormant spray, they reproduce so rapidly that in three generations they will be abundant enough to cause serious injury. Very thorough application of the correct spray mixture at just the right time, gives satisfactory control and is a good investment wherever lice are injurious to appl



The codling moth laying its eggs

Fighting the Codling Moth

By Chas. L. Robinson

THE past season in many parts of the country, especially in the Pacific Northwest, has been an unusually favorable one for the codling moth. Investigation has shown that on account of extraordinarily warm weather the moths laid many more eggs than usual and fully as large a proportion hatched as in normal years. This increase in the number of young worms combined with the extraordinarily rapid growth of the apples made it more necessary than usual for the grower to apply his spray just right. Even though the worm damage this season may have been somewhat unusual, the apple growers of the United States lose a total amount each year that is appalling. The government estimates for 1922 place the commercial apple crop of the United States at 96.000.000 bushels. The average loss from codling moth will be at least ten per cent. This is a very low proportion and some estimates might place it at 20 or 25 per cent but even at the former figure the growers are losing 12,800 carloads most of which might be saved with very little more expense in spraying and more careful attention to spray dates and details of application.

It seems to be a custom among many growers to lay the failure of their control methods to everything but themselves. This year the spray materials have received their share of abuse as well as the spray dates. Frequently the equipment is blamed, or the use of spreaders, or weather conditions, or that the worms have become immune to the poison and there are other excuses without end. Some of these factors may be to blame, at least in part, but generally we have discovered upon investigation that the grower has been careless.

Each year some growers are able to keep their worm damage down to a very low amount even though their neighbors have a heavy tonnage of culls. Worm control is simpler. Where all growers in a neighborhood are reasonably successful it is not only an individual problem but it is also a community one.

The British Columbia growers as a unit have taken warning from the experience of various sections of the United States and so far, by intensive eradication measures, have confined the codling moth infestation to a few hundred acres out of the 35,000 acres in the district. The entire cost of the campaign and loss from worm damage the past year spread over the apple acreage of the Province will not amount to a dollar per acre while the average apple grower in the codling moth belt of the United States probably spent close to twenty-five dollars per acre in his fight this past season in addition to the loss from culls. If each new apple district had been in position to attack the codling moth as a community they could have at least put off the general infestation for many years and saved millions of dollars.

Prior to 1919 the worm damage in the Sunnyslope district near Wenatchee had increased until it averaged about 20 per cent the preceding season. The growers were discouraged and came to the district horticultural inspector for aid, so he worked out a plan of campaign and succeeded in getting all of the apple growers in and are comprising about 1200 acres to put up one dollar per acre to hire a competent man to give close supervision to this spray program. Each grower agreed to follow the instructions in detail and some even went so far as to do some of their work over two or three times where they were shown they had not covered the trees thoroughly. At the end of the season the worm damage averaged less than two per cent for the entire acreage.

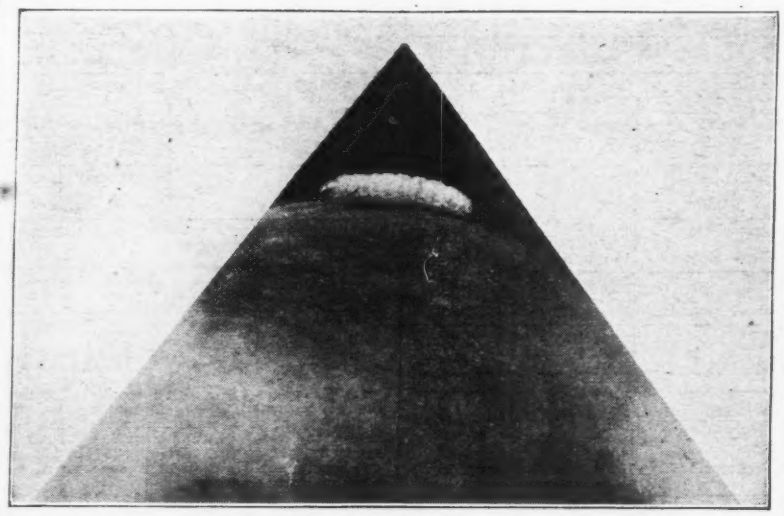
The next year ten or twelve similar districts were organized and just as striking results were obtained—in fact the loss from worms in a number of districts where the infestation had been heavy before averaged less than one per cent after the intensive campaign. The spray supervisors worked under the direction of the district horticultural inspector and they were required to follow certain definite recommendations from him as to methods of establishing spray dates and in applying the materials. A score card record was kept for each orchard and if one grower did not get as good results as his neighbor he could usually be shown why.

The following year, however, a number of growers in each district felt that they no longer needed this aid and that they had solved the control problem. The organization of such districts was therefore dropped as there was no way to compel all the growers to pay their share of the cost of the spray supervision. The result is that with the favorable season for the worms just past we are up against real need for organized effort in the same districts this coming season.

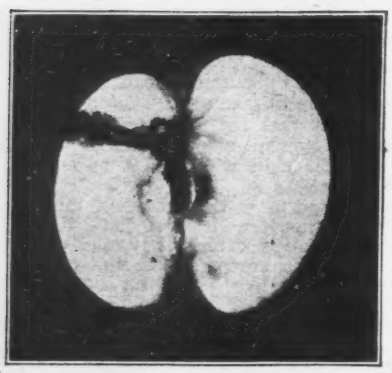
It would be very desirable to have a law in most states making it possible to organize local pest control districts for combating any kind of pests in that particular locality. This would be somewhat on the order of local improvement districts and could be organized on a petition of the majority of the growers in a certain district. The right pest control expert could then be hired to carry on the campaign and the cost assessed pro rata against all the infested acreage in the area. Each grower in the district should be compelled to carry out the instructions for the control of the pests. Colorado is said to have a satisfactory law which might provide a model. Even if such an organization is not possible, any apple grower should be able to get reasonably good results if he will follow out carefully the practices that have proven successful.

One orchardist with a twenty-five acre apple tract in the Yakima Valley had from 25 to 50 per cent wormy fruit in 1921. As he felt discouraged he asked that the local horticultural inspector give him some special attention for the season just past. He followed these instructions in detail and in spite of the unfavorable season he reduced the percent of wormy fruit to about 1½ per cent in his Winesaps and Jonathans and in the Rome Beauties he lost 8 per cent. This latter variety should have had a double calyx spray.

An inspector in starting a codling moth spray campaign should have several definite details in mind for his attention and that of the grower. These represent the practices which experience has proven to be successful and they may be grouped under six heads.



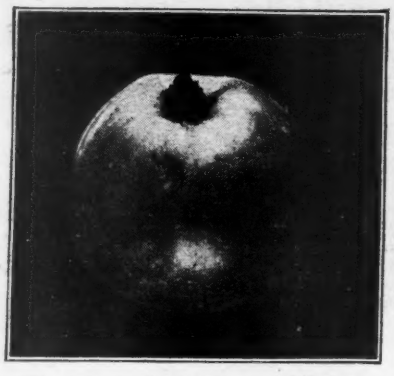
On the hunt for a good place to pupate



These photos loaned by the Oregon Experiment Station. The second brood generally enters the side of the apple. Photo shows great damage done to apple by codling moth, the most destructive apple pest in America.

Spray Machinery and Equipment

Before the season starts the spray machinery should be put in as good mechanical condition as possible for time lost on account of a broken down machine may mean failure in the season's control. The machine should be able to maintain at least 250 pounds pressure though in the last example mentioned a home made pump was used with which the pressure ranged from 240 to 275 pounds. Some growers prefer to use the rod in the calyx spray while others use the gun throughout the season. Good work can be done with either, though the guns are coming more into use because with them the material can be applied quicker and easier. Much depends on the man with the gun and it is not uncommon with the high pressure and large volume machines now in use for the man to attempt to cover too much ground in trying to keep up with the machine. The nozzles should be of medium size and the material should be applied as a fine mist so that it settles and envelops all parts of the fruit and foliage.



The worm often enters and leaves through the calyx

The Material

It has not been found necessary to use more than one pound of arsenate of lead to 50 gallons of water. Most of the standard brands of arsenate of lead will give good results where they are properly applied though the finer they are ground the better they stay in suspension and the more even covering they give. Various kinds of spreaders are being used more and more in order to secure an even coating on the fruit and leaves. Probably the most efficient spreader for the fruit is one of the soap type though the casein spreaders are more commonly used at the rate of one pound to a 200-gallon tank.

Setting Spray Dates

Various methods have been used by the growers and inspectors to establish the spray dates but the latest and most simple way is the temperature method recommended originally by the U. S. Bureau of Entomology and the Oregon Experiment Station. The calyx spray should be put on when most of the petals have fallen so this time is easily established but the first cover spray date is usually the most difficult to arrive at because the time of emergence of the moths varies from year to year. Under this system any grower can set accurate spray dates for any part of his orchard and it should be remembered that different slopes may vary as much as a week in the dates the spray should be applied. The entomologists discovered that the codling moth lays most of its eggs in the late afternoon or evening and then only when the temperature is 60 degrees Fahrenheit or warmer. By reading the thermometer in his orchard at 8 p. m. each evening after the calyx spray is completed the grower may know when the eggs are being laid and as the eggs will begin hatching in about ten days after the temperature reaches 60 degrees at the hour mentioned, the first cover spray should be applied just before that date.

The second cover spray should then be on fifteen days later than the first in order to be ready for the largest number of worms as they are about to enter the apples. Experiments have also shown that the rate of growth of the skin of the apple during this period is much more rapid than at any

Asleep in his winter home

Orchard Spray Program for the Pacific Northwest

by A. L. Lovett, Entomologist and H. P. Barss, Plant Pathologist
Oregon Agricultural Experiment Station

On account of the climatic differences existing between the more humid orchard sections west of the Cascade Mountains and the semi-arid or arid and irrigated regions east of this range, the conditions as to pests and diseases are different and require a somewhat different spray program. In general there are a greater number of diseases and pests to be sprayed for in western Oregon, Washington, and British Columbia than in the drier orchard sections of the interior. Hence the full spray program for the section west of Cascades will be presented and then followed by paragraphs outlining the program for other sections.

SPRAY PROGRAM I

For sections of Washington, Oregon and British Columbia west of Cascades, except the Rogue River Valley

APPLES AND PEARS

Time of Application	Pest or Disease	Spray Material and Strength
(1) Dormant spray. As winter buds swell just before opening.	San Jose Scale, Blister mite and Spider mites.	Lime-sulphur 12 to 100 or, for scale, miscible oil 8 to 100.
	Apple leaf roller. (Footnote 5).	Miscible oil 8 to 100.
(2) Delayed dormant spray Cluster buds separating just enough to expose blossom buds.	Scab and powdery Mildew.	Lime-sulphur 3½ to 100.
	Aphids on apple. (See Footnote 1).	Add Nicotine sulphate ¾ lb. to 100 gal. of spray.
(3) Pink or pre-blossom spray. Just before blossoms open.	Scab and Mildew.	Lime-sulphur 2½ to 100.
	Fruit worms on pear and Bud moth.	Add lead arsenate 2 pounds to 100 gallons of spray.
(4) Calyx spray. As last petals fall. Before apple calyx closes on central fruit in cluster.	Scab and Mildew.	Lime-sulphur 2½ to 100. (Footnote 2.)
	Codling moth on apple.	Lead arsenate 2 lbs. to 100 gals.
	Fruit worms on pear.	Lead arsenate 2 lbs. to 100 gals.
(5) Fifteen day spray. About 15 days after petals fall.	Scab and Mildew.	Lime-sulphur 2 to 100.
	Pear slug.	Lead arsenate 2 lbs. to 100 gals.
(6) Thirty day or first cover spray for worms. Three to five weeks after petals fall.	Codling moth (Footnote 3).	Lead arsenate 2 lbs. to 100 gals.
	Scab and Mildew.	Lime-sulphur 2 to 100.
(7) July spray. July 10 to 25 depending on locality and season.	Codling moth, second generation.	Lead arsenate 2 lbs. to 100 gals.
	Anthracnose canker.	See (Footnote 4).
(8) August spray. August 10 to Sept. 5 depending on season and locality.	Codling moth, (May usually be omitted on pear).	Same as for No. 7.

Footnote 1. Where aphids are very bad, especially with varieties somewhat resistant to scab, omit nicotine from Spray No. 2, adding it to Spray No. 3, which should then be applied just as soon as the blossom buds separate from each other.

Footnote 2. **Ordinary lime-sulphur** is liable to russet the skin of some varieties of pears like d' An jou, Comice and Howell, and may cause burning of apples when hot weather comes on. Under such circumstances substitute self-boiled lime-sulphur 8-8-50 or a reliable wettable sulphur or Atomic Sulphur 12 pounds to 100 gallons.

Footnote 3. **Codling Moth** control is still a vexing problem. This fact is particularly obvious following the disastrous season just closed. Spray programs designed to serve such a wide area are at best only suggestive. They should be supplemented with all the trained assistance and advice one may secure. Pears are less susceptible than apples. Where worms are bad the Calyx application on pears is advised. The late cover spray may usually be omitted on pears.

Supplement spray control with a conscientious collection and destruction of wormy fruit at thinning time. Scrape the scaly bark from the trees now; band the trees in June and destroy accumulated worms every two weeks. Increasing the dosage of lead arsenate in the last cover spray to 3 or even 4 pounds to the hundred gallons is a fairly common practice and, for bad cases, advisable. Codling moth is not a factor in commercial orchards of British Columbia and no program of control necessary.

Footnote 4. **Anthracnose** or black spot canker and fruit rot may be successfully prevented by a single thorough summer application of Bordeaux mixture 4-4-50. For the sake of economy this may be put in with the July or August worm spray. A fine misty spray should be used and if casein spreader is added it should be dissolved first in water before going into the tank. Commercial ready-mixed Bordeaux materials are inferior to the properly home made spray.

Footnote 5. **Leaf Rollers** occur, as a major pest, only in certain of our fruit sections. Oil emulsion in the delayed dormant is the standard spray. Conditions sometimes develop that prevent maximum efficiency from this application. Good results have been secured where this spray has been supplemented with a spray of lead arsenate, double strength (4-100) in the late pink, or even in the Calyx application.

PRUNES AND PLUMS

(1) Dormant spray. As winter buds are ready to open.	San Jose Scale, Spider mite, Twig miner.	Lime-sulphur 12 to 100. If scale is absent dilute 8 to 100.
(2) Pre-blossom spray. Buds white just before opening.	Brown rot Blossom blight.	Bordeaux 4-4-50 with spreader or lime-sulphur 3 to 100.
	Bud moth.	Lead arsenate 2 lbs., lime 2 pounds to 100 gallons.
	Aphids.	Nicotine sulphate ¾ pound to 100 gallons.
(3) First fruit spray. As soon as shucks fall.	Cylindrosporium leaf spot and Brown rot.	Self-boiled lime-sulphur 8-8-50 with spreader or Atomic Sulphur 12 lbs. to 100 gals.
	Syneta beetle.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gals.
(4) and (5) About June 1, and July 1.	Cylindrosporium or Brown rot if troublesome.	As under (3).
(6) August spray. About a month before harvest.	Brown rot.	As under (3).

PEACHES

Time of Application.	Pest or Disease	Spray Material and Strength
(1) Leaf Curl spray. From December to mid-Feb.	Peach Leaf Curl.	Bordeaux mixture 6-6-50.
(2) Late dormant spray. Just as first buds are ready to open.	Peach Twig miner, San Jose scale, Spider mite.	Lime-sulphur 12 to 100. If scale is absent dilute 8 to 100.
	Bud moth.	Lead arsenate 2 lbs., lime 2 lbs. to 100 gals.
(3) First fruit spray. As soon as shucks fall.	Peach blight (fruit spot) or Mildew.	Self-boiled lime-sulphur 8-8-50 with spreader or atomic sulphur 12 lbs. to 100 gals. If bad repeat once or twice at 2 or 3 week intervals.
(4) Late summer spray. About 6 weeks before harvest.	Brown rot.	Same as No. 3 or use dusting sulphur.
(5) Early fall spray. As soon as each variety is picked.	Peach blight and Die back.	Bordeaux 4-4-50.

CHERRIES

For San Jose Scale.—Same as No. 1 on prune program.

For Aphids.—Use nicotine sulphate 1 lb. to 100 gals. with pre-blossom spray (same as No. 2 for prune). Use tanglefoot bands on trees to prevent reinfestation of aphids by ants.

For Cherry Fruit Maggot.—Use sweetened poison spray for adult flies. Use: Lead arsenate, one-half pound; syrup, two quarts; water, 8 gallons. Apply about one quart to the tree, spraying the upper surface of the outer leaves only; when adult flies appear. This will be from June 8 to 20. Repeat application 10 days later and give a third spray one week after second.

For Brown Rot Blossom Blight.—Same as No. 2 on prune program.

For Cylindrosporium Leaf Spot—(Yellow Leaf). Same as Nos. 3, 4, 5, on prune program.

For Brown Rot on Fruit.—Use self-boiled lime-sulphur 8-8-50 with spreader, or Atomic Sulphur 12 lbs. to 100 gals. or a reliable wettable sulphur, one month before picking. Begin earlier if disease shows up sooner and repeat every three weeks till a month before picking.

APRICOTS

For Brown Rot Blossom Blight.—Same as No. 2 on prune program. Prune out all dead twigs and spurs in winter.

For Fruit Spot—(Peach Blight fungus). Same as No. 3 and 5 on peach program.

San Jose Scale and other insects same control as for similar insects on peach.

SPRAY PROGRAM II

For all sections of the Northwest east of Cascade Range and for Rogue River Valley in Oregon.

APPLES AND PEARS

Scab.—Present and troublesome only in a few localities. Where sufficiently abundant to justify spraying, apply Nos. 3 and 4 in Program 1 for apples and pears.

Powdery Mildew.—Use applications Nos. 3, 4 and 5 in Program 1 for apples. Continue if necessary. Observe Footnote 2. Use casein spreader first dissolved in water. Supplement by winter and summer pruning out. Pink spray most important to avoid sulphur shock.

Codling Moth.—(Except for British Columbia). Following the calyx application the first cover spray (30 day) is applied just before first worms hatch. In general this will be earlier for interior (15 days) than for coast area. Follow with: second cover spray two weeks after first cover spray; third cover spray four weeks later, and fourth cover spray four weeks after third.

For southern Oregon an additional late cover spray may be necessary. Double strength lead in late sprays advisable. Calyx spray on pears, likewise advisable in southern Oregon.

For eastern Washington, northern Idaho, the Grande Ronde Valley of Oregon, follow Program 1, although in higher altitudes probably two cover sprays will generally suffice.

Citrus Red Spider.—Use spray No. 1 in Program 1, as for red spiders.

Blister Mite.—Use spray No. 1 in Program 1. Take care to get application on apple early.

Leaf Rollers, Fruit Worms, San Jose Scale, Aphids.—Follow Program 1 for these insects.

PEACHES

Leaf Curl, Mildew and California Blight, Twig Miner, San Jose Scale, Spider Mite.—Follow Program 1 for these diseases and insects.

CHERRIES

Practically no fungus diseases requiring spray. Insects in general would require no regular program of sprays. For specific pests follow Program 1 for cherry.

APRICOTS

California Blight.—Follow Program 1 for peach blight. Insect pests and treatment same as for peach in Program 1.

PRUNES AND PLUMS

No fungus diseases requiring spray as a rule.

San Jose Scale, Twig Miner and Spider Mite, are principal insect pests. Where present control with spray No. 1 in Program 1 for prunes and plums.

SPRAY POINTERS

What Not to Spray For.—Know what particular pests and diseases are locally troublesome and follow carefully the proper program for these. Don't waste time and spray materials fighting troubles that don't exist in your orchard. If you don't know what pests and diseases you have to fight get your fruit inspector or somebody who does know to instruct you. It doesn't pay to fight unknown enemies in the dark.

Spraying Economy.—Harvest results always show that it is poor economy to use a spray outfit of inadequate capacity or power to do the work right and in a reasonably short time. It is also poor economy to save on spray. Thorough covering of every particle of surface on the tree from top to bottom is the secret of 100% results.

Spreaders.—Materials used with a fungicide or insecticide spray to increase the spreading and adhesive powers are rapidly coming to the front. Calcium caseinate is excellent for use with lead arsenate alone. Where added in powder form to sprays containing Bordeaux, lime-sulphur or other fungicide it sometimes gums things up badly. In such cases it is suggested that the spreader be completely dissolved in water before adding to the spray tank.

Dusting.—Former experimental work in the Northwest in general has not been very encouraging to the substitution of dusting for spraying especially in those sections subject to severe attacks of fungus diseases under relatively cool climatic conditions, but improved materials, machinery and application methods recently developed and now under test may alter the outlook somewhat in the near future.

Spray Combinations.—Any of the materials referred to in this spray program may be successfully combined. It is best to add lead arsenate to a tank of diluted lime-sulphur the last thing before starting to spray.

Sulphur Shock.—Under certain climatic conditions if lime-sulphur is not used on apple trees in the earlier delayed-dormant or pink applications, a very severe injury with foliage and fruit drop may result when lime-sulphur is applied later after blooming. This is known as sulphur shock and occurs without regard to strength of spray. Immunity against this danger can be secured only by application of the pre-blossom sprays as scheduled.

other time so that it is very important to have the apples well covered and also because every worm killed at this time means less later in the season.

The third cover spray comes six or seven weeks after the first or about a month after the second, and the fourth comes about four weeks after the third. By following this system of setting the dates in the illustration mentioned above, the calyx spray was applied May 19 and 20, the first cover spray June 6, second cover spray June 19, third cover spray July 17 and fourth cover spray August 14.

Thoroughness in Application

It should be remembered that thoroughness and complete covering with the spray is essential to success. It is not enough to try to hit the fruit that the sprayer sees but he must cover all the tree. The successful sprayer goes back and checks upon himself to see whether he has missed any spots or not. Special attention should be given to the tops of the trees and no one should attempt to spray in a high wind.

Careful Thinning

Careful thinning is another important orchard practice which should be a regular part of the codling moth campaign. This should be done early and the thinner should be instructed to pocket the wormy apples so they can be carefully destroyed. Probably the surest and simplest way to do this is to dump them into a barrel half full of water with a little kerosene on top.

General Orchard Practice

The trees should be carefully pruned and opened up so that the spray can reach all parts of the tree without difficulty. It may be necessary to head back old trees severely. It is sometimes necessary or desirable to recommend that burlap bands be placed around the trunks of the trees where infestation is heavy. These should be removed about once in two weeks during the summer and any cocoons found destroyed. Cultivation will kill some of the larvae in the ground and attention should also be given to packing houses or other buildings where the old boxes are stored that may contain many hibernating larvae. The grower should also keep an accurate record of his spray program including notes on the weather so that he may be able to check back on his successes or failures.

Prominent Enemies of the Peach

By M. A. Blake

THE person who continually recounts his troubles and worries about all of the things that might happen to him leads a drab and mournful existence.

It is possible for an entomologist or a plant pathologist to list and describe the insect and disease enemies of any one of our common tree fruits in such a manner as to make it appear to the inexperienced fruit grower at least that the trees are hopelessly surrounded by enemies and it is only by special dispensation of providence when one survives.

In sporting circles the remark is sometimes made that a team is "beaten before it takes the field." In other words this means that the players have already accepted defeat and believe that it is impossible for them to win.

A fruit grower who enters the business in a half hearted manner or is doubtful at the start of his ability to control the common enemies of the crop he expects to grow is under a heavy handicap.

It is obvious that specialists upon the control of fruit pests should emphasize the efficiency of control measures rather than to magnify the number of pests and the difficulties of their control.

It is said that there are some 400 different kinds of insects that may attack the apple and there are seasons and occasions when a grower might readily believe that the entire 400 were assaulting one tree at one time. The facts of the problem are however, that we know far more about control measures today than was the case a decade

Twigs of peach from sprayed and unsprayed trees, illustrating the control of peach leaf curl. No. 2 sprayed with winter strength lime and sulphur.

ago and in spite of such dire predictions as those of about the period of 1900 to 1904 that the San Jose' scale would eliminate fruit production in America we are growing more and better fruit than ever before and the San Jose scale is no longer a "bugbear."

Of the numerous pests which may attack any one kind of fruit some never cause damage sufficient to recognize it as of practical importance and of those which may cause economic loss only a relatively few are likely to be serious in any one locality in a single season.

Pest control is a prominent item in the modern cost of fruit production but the bulk of the expense is caused by a relatively few enemies. Fortunately, too a remedy applied for one sometimes serves to control another which simplifies our problem.

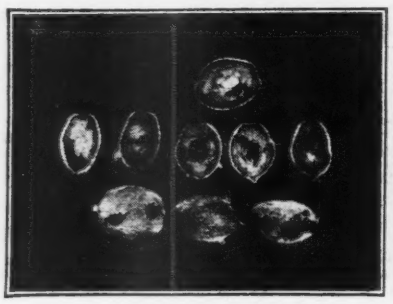
Insects Injurious to the Peach

The more prominent insects injurious to the peach include the peach borer, plum curculio and San Jose scale. Of lesser importance from a country wide standpoint and in the amount of damage done might be mentioned the bark beetle, rose chafer, black and green aphis, terrapin scale, false tarnished plant bug and the red spider.

A new invader from the Orient, the Oriental peach moth, is assuming considerable prominence in some districts.

The Common Peach Borer

The peach root borer is a native insect which has caused great damage to the trees since early colonial times. Until very recently the only satisfactory method of control was to dig the



Young fruits of the peach infested with curculio

soil away from about the trunk of the tree and annually remove the borers by means of a knife and a wire. Excavating about low headed trees is not an easy task in itself upon stony, mountain land and after spending a few days removing stones and soil and hunting for borer lavae upon hands and knees one could hardly blame a laborer for feeling that he was becoming a sort of a hybrid between a wood-chuck or prairie dog and a woodpecker. It was impossible to find enough men who could be depended upon to be thorough in removing borers and many orchards showed it particularly during and immediately after the recent world war. Fortunately, an effective remedy for this pest has been discovered in the material known as paradichlorobenzine or P. C. Benzine for short.

Briefly, its application is as follows:

1. It should be applied in late summer and early fall after the young borers have hatched from the eggs. This period will vary from about Sept. 1 to Oct. 1 in different localities.

2. The temperature of the soil should be at least 60° F. for good results and 70° F. is better. Therefore the treatment should be made somewhat earlier in northern districts than in southern districts.

3. Properly applied the treatment has been found safe upon trees 4 to 5 years of age and older. It should be used with caution upon younger trees.

4. Prepare the trees for the treatment by removing all weeds and trash and gum from about the trunk to a distance of at least 12 inches leaving the soil level.

5. Apply one ounce of P. C. Benzine in a circular ring about the tree. This ring should be a uniform band of material two inches distant from the tree trunk. If it is closer than this it may cause injury while if it is much farther away than 4—6 inches it may be ineffective.

6. After the ring of material is applied cover it with several inches of soil mounded up about the tree. Be careful in applying the soil not to scatter the crystals of P. C. Benzine.

When the temperature of the soil is 70° F. the borers should be killed within 10-14 days but it may require 3 weeks if the temperature ranges from 55 to 60° F.

The San Jose Scale

For several years after its introduction this was the most feared of the insect enemies of the peach but now although it is widely distributed its control is taken as a mere detail of orchard routine. Thorough spraying during the dormant season with such a material as winter strength lime sulfur controls it satisfactorily. Where summer spraying is thorough and frequent for the control of brown rot and scab the scale has in some cases become a minor peach pest.

The Plum Curculio

This snout beetle is an old enemy of the stone fruits and also of the apple and pear and is rather difficult to control by spraying upon such smooth skinned fruits as the plum and nectarine.

Tree in advanced stage of yellows

It causes damage to stone fruits largely in two ways. 1. By laying its eggs in the young fruits from which the larvae hatch, feed upon and about the germs or pits causing the infested fruits to fall to the ground and 2, by making crescent shaped cuts and irregular feeding punctures in the fruit which result in ugly blemishes and misshapen specimens.

It leaves its winter quarters in grass lands, hedgerows and fence corners about the time the peach trees come into bloom. It feeds upon the expanding leaves of the peach until the fruits swell sufficiently to cause the calyx or "shuck" to separate from its base. As soon as even a sixteenth of an inch of peach is exposed between its attachment to the stem and the cast "shuck" the curculio begins feeding and egg laying. Where there is an excess of fruit setting upon the trees some thinning by curculio may not result in great economic loss but where the set of fruit is light curculio injury is always serious and occasionally the entire crop of young fruits is destroyed even upon well set trees. In the south. a late brood may cause the fruit of even a variety like Elberta to be wormy when it is ready for market.

The curculio can be kept in check upon the peach by keeping the surroundings of the orchard clear of leaves, old grass and rubbish and by thorough spraying at the fruit developing period.

Most of the failures in its control are due to three things, spraying too late, not spraying often enough and applying too little spray in an incomplete manner. The first spray must be applied just as the calyces start to shed and before they are half off. In cases of serious infestation a second spray should follow within 10 days. The applications must be thorough enough to coat every fruit. Additional sprayings may be required in southern districts. Arsenate of lead at the rate of 3 lbs. of powder to 100 gallons of self-boiled lime sulfur or the new Dry Mix Sulfur Lime should prove effective when applied upon the above basis.

The Bark Beetle

When peach trees become weakened from any cause gum may be noticed exuding from numerous points upon the trunk and branches. An examination commonly reveals little black beetles burrowing between the bark and sap wood. A badly infested tree is likely to mean that it is so weakened from other causes such as borers or winter injury that it is not worth saving. The remedy is in prevention. Keep the trees growing vigorously and free from dying and dead branches and this insect will seldom prove serious.

The Rose Chafer

The rose bug is a serious insect pest of roses, grapes and many other plants in some of the eastern peach districts. It may appear in the peach orchard in large numbers when the fruits are an inch or more in diameter and cause the destruction of many fruits unless driven away. It has a great aversion for self-boiled lime and sulfur to which many peach growers may say "Amen" but this pest will leave a peach or apple orchard that has been thoroughly coated with this spray and seek its food elsewhere. Strange as it may seem diluted concentrated lime-sulfur and arsenate of lead is not nearly so effective.

The Effective Control of Chewing Insects Means Keeping Their Numbers Limited

Chewing insects are controlled by the use of stomach poisons. These poisons are applied to the leaves, twigs and fruits of the attacked plants. The insect must eat a certain amount of plant tissue in order to obtain enough poison to be killed. It becomes apparent then that if the insects appear in great numbers considerable injury may result even where the poison is effective. Successful control of both insects and diseases is often a matter of consistent and persistent annual spraying.

The Oriental Peach Moth

This is a new enemy of the peach which has established itself upon the Atlantic coast. It is practically a cod-

A mature peach almost entirely decayed with brown rot and exhibiting a mass of spores

ling moth of the peach and attacks both twigs and fruits. The larvae eat their way into the fruits and it is rather difficult to detect all worm infested specimens at ripening time. No successful remedy is known at present but it is only a recent introduction and there has been relatively little opportunity for investigation.

Diseases of the Peach

The more serious diseases of the peach from the standpoint of annual money loss throughout the United States include brown rot, leaf curl, peach scab or black spot and yellows, little peach and peach rosette which are grouped in this discussion. Other diseases which are troublesome in some localities at times include bacterial leaf spot and California peach blight. Powdery mildew and root-gall are usually of minor importance.

Brown Rot

Growers of stone fruits are quite generally familiar with the fact that this is the disease that may cause rapid decay of ripening cherries,

(*Continued on page 21*)

Spray Schedule for New England

By Fred Sears, Massachusetts Agricultural College

APPLE

Time of Application	Materials Used	Enemy	Remarks
(1) Delayed Dormant. Early spring as buds are breaking.	Lime-sulphur 6 gals. in 50. 40% Nicotine sulphate ⅝ pt.	Aphis, San Jose Scale, Blister mite.	This spray has very largely superceded the dormant application.
(2) Pre-Pink. Before the clusters of blossom buds separate.	Lime-sulphur 1 gal. in 50.	Apple Scab.	Used on McIntosh and other varieties especially subject to scab. Very effective.
(3) Blossom-Pink. As blossom buds begin to show pink.	Lime-sulphur 1 gal. in 50. Arsenate of lead paste 3 lbs. Powder 1½ lbs. Nicotine sulphate ½ pint.	Red Bug, Scab, Curculio, Aphis, Tent Caterpillar, Bud Moth, Brown Tail Moth, Gypsy Moth, Canker Worm.	In areas where the Gypsy Moth is troublesome the amount of arsenate of lead is doubled.
(4) Calyx. When last of petals are falling.	Same as (3).	Codling Moth, Scab, Curculio, Red Bug, Aphis, Gypsy Moth, Sooty fungus.	Generally regarded as the most important single spray.
(5) 3 or 4 weeks after Calyx spray.	Same as calyx spray except no nicotine sulphate.	Same as calyx except Red Bug and Aphis.	

NOTES

1. **Special Sprays.**—The following special sprays are sometimes applied in addition to those listed above:

1. Where plum Curculio is serious on apples a spray of arsenate of lead, usual strength, is applied a week or ten days after the calyx spray.

2. In seasons, or localities where Sooty fungus is expected to be serious a spray of lime-sulphur, 1 gal. to 50, is made about two months after the calyx spray.

2. Bordeaux mixture is being used somewhat for the pre-pink and pink sprays on the theory that it is more effective than lime-sulphur. It does not appear to russet the fruit appreciably if used at these times.

3. Dry Lime-sulphur has not been used extensively by New England orchardists. It costs more per gallon of spray and some brands do not thoroughly dissolve, which leaves a residue that wears out nozzles.

4. Dusting was quite commonly used, instead of spraying, in parts of Maine in 1921, but has not been used to any extent in other parts of New England.

PEACH

Time of Application	Materials Used	Enemy	Remarks
(1) Dormant Spray applied either late autumn or early spring before buds begin to swell.	Lime-sulphur 6 gals. in 50.	San Jose Scale and Leaf Curl.	Autumn application is increasing.
(2) First summer spray just as the calyxes begin to fall from the small fruits	Self-boiled lime-sulphur or atomic sulphur; 3 lbs. arsenate of lead paste or 1½ lbs. powder	Curculio, Brown Rot, Scab.	If Aphis is present add ¼ pint nicotine sulphate per 50 gals.
(3) Second summer spray applied 2 or 3 weeks after No. 2.	Same as No. 2.	Same as No. 2.	
(4) Third summer spray applied 2 or 3 weeks after No. 3.	Self-boiled lime-sulphur or atomic sulphur.	Brown Rot and Scab.	May be omitted on early ripening varieties.

PEAR

(1) Cluster Bud, as blossom buds separate in clusters.	Lime sulphur 6 gals. in 50. Nicotine sulphate ½ pint.	Scale, Scab, Blister Mite, Psylla (eggs and hibernatting adults).	
(2) Calyx. Just after petals fall.	Lime-sulphur 1 gal. in 50 gals. Arsenate of lead 3 lbs. paste or 1½ lbs. powder. Nicotine sulphate ⅝ pint.	Codling Moth, Curculio, Scab.	Most important single spray.
(3) 4 or 5 weeks after calyx spray.	Same materials as calyx spray except nicotine sulphate.	Codling Moth, Scab, other fungus diseases and leafing insects.	

NOTE.—Some growers are using an oil spray or winter strength lime-sulphur as a delayed dormant spray.

Fungus Diseases of the Apple

By A. D. Selby

Botanist, Ohio Agricultural Experiment Station

IN OUR thought about apple diseases caused by parasitic fungi and bacteria and their control we are very liable to fail in the full grasp of what we have to control. The orchard manager is very certain to have his effectiveness in disease prevention modified by grasp of his problem. To start with the season, our problem is yearly undergoing change, as compared with that of twenty years ago. The law of plant disease increase under more intensive growing is that it takes on a geometric ratio of increase. For every doubling of crop production possibly we have an actual fourfold increase of diseases. This may not appear to such as wish to prevent the count from running away from past conditions in disease, but the pace is moving under existing conditions.

Conditions of modification are many in number and various in character, involving all the surrounding factors of difference.

Scab in Chili

Personally the surprise and astonishment of my life was met in Valdivia, province of Chile, in February, 1920. Having been asked while at home to identify canker on apple twigs found there, I placed myself in the hands of the correspondents, who in turn secured a Scotch guide and interpreter. Apple scab showed an amount on local seedling apple trees before unbelieved. Even the Rome Beauty and the Winesap trees of the Ohio Vally were at worst moderately attacked. The cider apples showed ten times as much or more? Why? Back of varietal susceptibility to scab disease was another reason. It seemed to be there in the fact that the yearly rainfall at the point is 103 to 105 inches. The continuous moisture conditions for the fruiting season are three to four times those of our apple district—ours is an excessive factor compared with the moisture in western districts where irrigation is practiced to supply water for the orchard.

What are your individual conditions as to temperature and moisture, including rain, fog and wind exposure during the year? The soil food and moisture supplies are necessary to production.

What are the apple diseases of the Ohio Valley? The fungous diseases of the apple are several and these indicate power to inflict injury, to impose loss. The apple grower who would counteract or control such parasitic diseases would apply the effective spray at the seasonal period, while this appears at times to be prolonged and may be passed by if missed.

The Major Diseases

We have in the Ohio Valley several major fungous and bacterial diseases of the apple, namely, black rot (frog eye, leaf spot), apple scab, fire blight, apple blotch, bitter rot, sooty fungus, fly speck and the new Phoma fruit spot or Brook's spot, with more or less shifting of the problems under seasonal conditions. The grower comes to think of these sprays according to their related diseases and development of the tree, well enough expressed in the outline designated as of the sprays to be applied. As a matter of fact, spray No. 3 of the list is dominated by the need to control codling moth. and spray No. 6 is for the second brood of codling moth. The spray for "Phoma fruit spot" (Brook's spot) is appearing as a new demand for our practice, and may be a regular one at the time of the second brood codling moth. In Ohio the plan to follow an apple disease spraying program through the season has shown clear advantages and is followed in this outline. The general discussion for convenience combines directions for both disease and insect control:

Spray No. 1a, Delayed dormant—control of San Jose scale, in absence not used.

Spray No. 1b, Pre-pink spray—before cluster buds show pink. Available for scab.

Spray No. 2, Pre-blossom spray—When buds show pink before blossoms open. Timed for scab.

Spray No. 3, Calyx cup spray—just after petals fall.

Spray No. 4, Two weeks spray—two weeks later.

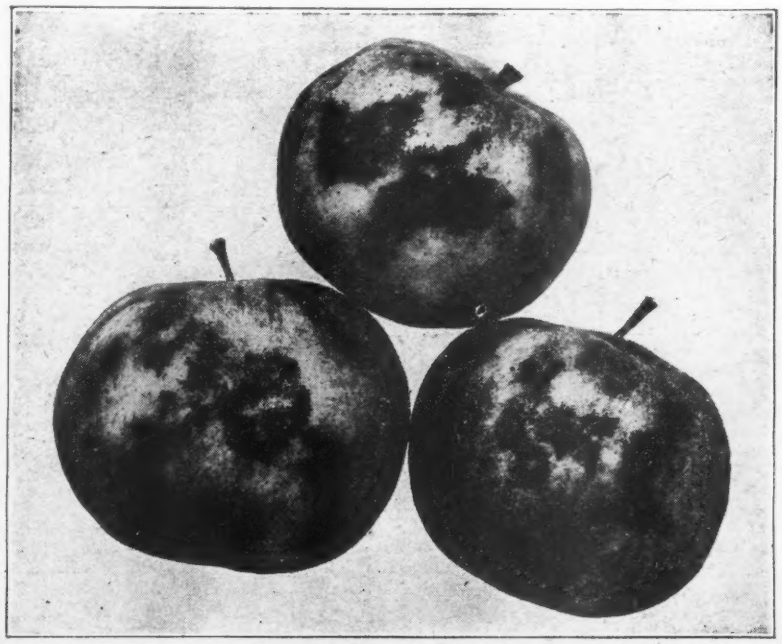
Spray No. 5, Special blotch spray—for severe blotch infection.

Spray No. 6, Second brood codling moth—9 to 10 weeks after spray No. 3.

Spray No. 7, Special.

The season's orchard spraying has an object, which is the control of the diseases prevalent in the orchard, together with the control of the apple codling moth. At times a prolonged early period of unsettled weather, including showery weather, favors the growth of scab on all growth. Spray No. 1b, the pre-pink application of Bordeaux mixture 4-6-50 is very useful at this time and keeps down infection by scab on both foliage and fruit. This spray is needed worst where there is a large hold-over of disease on the fallen leaves and on twigs, and for "frog-eye." It is here used as an extra insurance spray, and is to be made of the same material as spray No. 2, for the disease frog-eye, black rot and apple scab as a sanitation precaution.

Spray No. 2, Bordeaux 4-6-50, preblossom spray, when cluster buds show pink before blossom opens. This application is timed to meet the young growth and opening clusters of the blossoms. We regard it as the most important spray of the season in disease control. The danger from injury



Blotch on Greening apple

(*Continued on page 14*)

Prominent Enemies of the Peach

By M. A. Blake

THE person who continually recounts his troubles and worries about all of the things that might happen to him leads a drab and mournful existence.

It is possible for an entomologist or a plant pathologist to list and describe the insect and disease enemies of any one of our common tree fruits in such a manner as to make it appear to the inexperienced fruit grower at least that the trees are hopelessly surrounded by enemies and it is only by special dispensation of providence when one survives.

In sporting circles the remark is sometimes made that a team is "beaten before it takes the field." In other words this means that the players have already accepted defeat and believe that it is impossible for them to win.

A fruit grower who enters the business in a half hearted manner or is doubtful at the start of his ability to control the common enemies of the crop he expects to grow is under a heavy handicap.

It is obvious that specialists upon the control of fruit pests should emphasize the efficiency of control measures rather than to magnify the number of pests and the difficulties of their control.

It is said that there are some 400 different kinds of insects that may attack the apple and there are seasons and occasions when a grower might readily believe that the entire 400 were assaulting one tree at one time. The facts of the problem are however, that we know far more about control measures today than was the case a decade

Twigs of peach from sprayed and unsprayed trees, illustrating the control of peach leaf curl. No. 2 sprayed with winter strength lime and sulphur.

ago and in spite of such dire predictions as those of about the period of 1900 to 1904 that the San Jose' scale would eliminate fruit production in America we are growing more and better fruit than ever before and the San Jose scale is no longer a "bugbear."

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Pest control is a prominent item in the modern cost of fruit production but the bulk of the expense is caused by a relatively few enemies. Fortunately, too a remedy applied for one sometimes serves to control another which simplifies our problem.

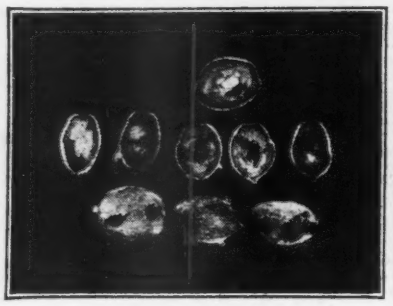
Insects Injurious to the Peach

The more prominent insects injurious to the peach include the peach borer, plum curculio and San Jose scale. Of lesser importance from a country wide standpoint and in the amount of damage done might be mentioned the bark beetle, rose chafer, black and green aphis, terrapin scale, false tarnished plant bug and the red spider.

A new invader from the Orient, the Oriental peach moth, is assuming considerable prominence in some districts.

The Common Peach Borer

The peach root borer is a native insect which has caused great damage to the trees since early colonial times. Until very recently the only satisfactory method of control was to dig the



Young fruits of the peach infested with curculio

soil away from about the trunk of the tree and annually remove the borers by means of a knife and a wire. Excavating about low headed trees is not an easy task in itself upon stony, mountain land and after spending a few days removing stones and soil and hunting for borer lavae upon hands and knees one could hardly blame a laborer for feeling that he was becoming a sort of a hybrid between a wood-chuck or prairie dog and a woodpecker. It was impossible to find enough men who could be depended upon to be thorough in removing borers and many orchards showed it particularly during and immediately after the recent world war. Fortunately, an effective remedy for this pest has been discovered in the material known as paradichlorobenzine or P. C. Benzine for short.

Briefly, its application is as follows:

1. It should be applied in late summer and early fall after the young borers have hatched from the eggs. This period will vary from about Sept. 1 to Oct. 1 in different localities.

2. The temperature of the soil should be at least 60° F. for good results and 70° F. is better. Therefore the treatment should be made somewhat earlier in northern districts than in southern districts.

3. Properly applied the treatment has been found safe upon trees 4 to 5 years of age and older. It should be used with caution upon younger trees.

4. Prepare the trees for the treatment by removing all weeds and trash and gum from about the trunk to a distance of at least 12 inches leaving the soil level.

5. Apply one ounce of P. C. Benzine in a circular ring about the tree. This ring should be a uniform band of material two inches distant from the tree trunk. If it is closer than this it may cause injury while if it is much farther away than 4—6 inches it may be ineffective.

6. After the ring of material is applied cover it with several inches of soil mounded up about the tree. Be careful in applying the soil not to scatter the crystals of P. C. Benzine.

When the temperature of the soil is 70° F. the borers should be killed within 10-14 days but it may require 3 weeks if the temperature ranges from 55 to 60° F.

The San Jose Scale

For several years after its introduction this was the most feared of the insect enemies of the peach but now although it is widely distributed its control is taken as a mere detail of orchard routine. Thorough spraying during the dormant season with such a material as winter strength lime sulfur controls it satisfactorily. Where summer spraying is thorough and frequent for the control of brown rot and scab the scale has in some cases become a minor peach pest.

The Plum Curculio

This snout beetle is an old enemy of the stone fruits and also of the apple and pear and is rather difficult to control by spraying upon such smooth skinned fruits as the plum and nectarine.

Tree in advanced stage of yellows

It causes damage to stone fruits largely in two ways. 1. By laying its eggs in the young fruits from which the larvae hatch, feed upon and about the germs or pits causing the infested fruits to fall to the ground and 2, by making crescent shaped cuts and irregular feeding punctures in the fruit which result in ugly blemishes and misshapen specimens.

It leaves its winter quarters in grass lands, hedgerows and fence corners about the time the peach trees come into bloom. It feeds upon the expanding leaves of the peach until the fruits swell sufficiently to cause the calyx or "shuck" to separate from its base. As soon as even a sixteenth of an inch of peach is exposed between its attachment to the stem and the cast "shuck" the curculio begins feeding and egg laying. Where there is an excess of fruit setting upon the trees some thinning by curculio may not result in great economic loss but where the set of fruit is light curculio injury is always serious and occasionally the entire crop of young fruits is destroyed even upon well set trees. In the south. a late brood may cause the fruit of even a variety like Elberta to be wormy when it is ready for market.

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(*Continued on page 21*)

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By Fred Sears, Massachusetts Agricultural College

APPLE

Time of Application	Materials Used	Enemy	Remarks
(1) Delayed Dormant. Early spring as buds are breaking.	Lime-sulphur 6 gals. in 50. 40% Nicotine sulphate ⅜ pt.	Aphis, San Jose Scale, Blister mite.	This spray has very largely superceded the dormant application.
(2) Pre-Pink. Before the clusters of blossom buds separate.	Lime-sulphur 1 gal. in 50.	Apple Scab.	Used on McIntosh and other varieties especially subject to scab. Very effective.
(3) Blossom-Pink. As blossom buds begin to show pink.	Lime-sulphur 1 gal. in 50. Arsenate of lead paste 3 lbs. Powder 1½ lbs. Nicotine sulphate ½ pint.	Red Bug, Scab, Curculio, Aphis, Tent Caterpillar, Bud Moth, Brown Tail Moth, Gypsy Moth, Canker Worm.	In areas where the Gypsy Moth is troublesome the amount of arsenate of lead is doubled.
(4) Calyx. When last of petals are falling.	Same as (3).	Codling Moth, Scab, Curculio, Red Bug, Aphis, Gypsy Moth, Sooty fungus.	Generally regarded as the most important single spray.
(5) 3 or 4 weeks after Calyx spray.	Same as calyx spray except no nicotine sulphate.	Same as calyx except Red Bug and Aphis.	

NOTES

1. **Special Sprays.**—The following special sprays are sometimes applied in addition to those listed above:

1. Where plum Curculio is serious on apples a spray of arsenate of lead, usual strength, is applied a week or ten days after the calyx spray.

2. In seasons, or localities where Sooty fungus is expected to be serious a spray of lime-sulphur, 1 gal. to 50, is made about two months after the calyx spray.

2. Bordeaux mixture is being used somewhat for the pre-pink and pink sprays on the theory that it is more effective than lime-sulphur. It does not appear to russet the fruit appreciably if used at these times.

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4. Dusting was quite commonly used, instead of spraying, in parts of Maine in 1921, but has not been used to any extent in other parts of New England.

PEACH

Time of Application	Materials Used	Enemy	Remarks
(1) Dormant Spray applied either late autumn or early spring before buds begin to swell.	Lime-sulphur 6 gals. in 50.	San Jose Scale and Leaf Curl.	Autumn application is increasing.
(2) First summer spray just as the calyxes begin to fall from the small fruits	Self-boiled lime-sulphur or atomic sulphur; 3 lbs. arsenate of lead paste or 1½ lbs. powder	Curculio, Brown Rot, Scab.	If Aphis is present add ¼ pint nicotine sulphate per 50 gals.
(3) Second summer spray applied 2 or 3 weeks after No. 2.	Same as No. 2.	Same as No. 2.	
(4) Third summer spray applied 2 or 3 weeks after No. 3.	Self-boiled lime-sulphur or atomic sulphur.	Brown Rot and Scab.	May be omitted on early ripening varieties.

PEAR

(1) Cluster Bud, as blossom buds separate in clusters.	Lime sulphur 6 gals. in 50. Nicotine sulphate ½ pint.	Scale, Scab, Blister Mite, Psylla (eggs and hibernatting adults).	
(2) Calyx. Just after petals fall.	Lime-sulphur 1 gal. in 50 gals. Arsenate of lead 3 lbs. paste or 1½ lbs. powder. Nicotine sulphate ⅜ pint.	Codling Moth, Curculio, Scab.	Most important single spray.
(3) 4 or 5 weeks after calyx spray.	Same materials as calyx spray except nicotine sulphate.	Codling Moth, Scab, other fungus diseases and leafing insects.	

NOTE.—Some growers are using an oil spray or winter strength lime-sulphur as a delayed dormant spray.

Fungus Diseases of the Apple

By A. D. Selby

Botanist, Ohio Agricultural Experiment Station

IN OUR thought about apple diseases caused by parasitic fungi and bacteria and their control we are very liable to fail in the full grasp of what we have to control. The orchard manager is very certain to have his effectiveness in disease prevention modified by grasp of his problem. To start with the season, our problem is yearly undergoing change, as compared with that of twenty years ago. The law of plant disease increase under more intensive growing is that it takes on a geometric ratio of increase. For every doubling of crop production possibly we have an actual fourfold increase of diseases. This may not appear to such as wish to prevent the count from running away from past conditions in disease, but the pace is moving under existing conditions.

Conditions of modification are many in number and various in character, involving all the surrounding factors of difference.

Scab in Chili

Personally the surprise and astonishment of my life was met in Valdivia, province of Chile, in February, 1920. Having been asked while at home to identify canker on apple twigs found there, I placed myself in the hands of the correspondents, who in turn secured a Scotch guide and interpreter. Apple scab showed an amount on local seedling apple trees before unbelieved. Even the Rome Beauty and the Winesap trees of the Ohio Vally were at worst moderately attacked. The cider apples showed ten times as much or more? Why? Back of varietal susceptibility to scab disease was another reason. It seemed to be there in the fact that the yearly rainfall at the point is 103 to 105 inches. The continuous moisture conditions for the fruiting season are three to four times those of our apple district—ours is an excessive factor compared with the moisture in western districts where irrigation is practiced to supply water for the orchard.

What are your individual conditions as to temperature and moisture, including rain, fog and wind exposure during the year? The soil food and moisture supplies are necessary to production.

What are the apple diseases of the Ohio Valley? The fungous diseases of the apple are several and these indicate power to inflict injury, to impose loss. The apple grower who would counteract or control such parasitic diseases would apply the effective spray at the seasonal period, while this appears at times to be prolonged and may be passed by if missed.

The Major Diseases

We have in the Ohio Valley several major fungous and bacterial diseases of the apple, namely, black rot (frog eye, leaf spot), apple scab, fire blight, apple blotch, bitter rot, sooty fungus, fly speck and the new Phoma fruit spot or Brook's spot, with more or less shifting of the problems under seasonal conditions. The grower comes to think of these sprays according to their related diseases and development of the tree, well enough expressed in the outline designated as of the sprays to be applied. As a matter of fact, spray No. 3 of the list is dominated by the need to control codling moth. and spray No. 6 is for the second brood of codling moth. The spray for "Phoma fruit spot" (Brook's spot) is appearing as a new demand for our practice, and may be a regular one at the time of the second brood codling moth. In Ohio the plan to follow an apple disease spraying program through the season has shown clear advantages and is followed in this outline. The general discussion for convenience combines directions for both disease and insect control:

Spray No. 1a, Delayed dormant—control of San Jose scale, in absence not used.

Spray No. 1b, Pre-pink spray—before cluster buds show pink. Available for scab.

Spray No. 2, Pre-blossom spray—When buds show pink before blossoms open. Timed for scab.

Spray No. 3, Calyx cup spray—just after petals fall.

Spray No. 4, Two weeks spray—two weeks later.

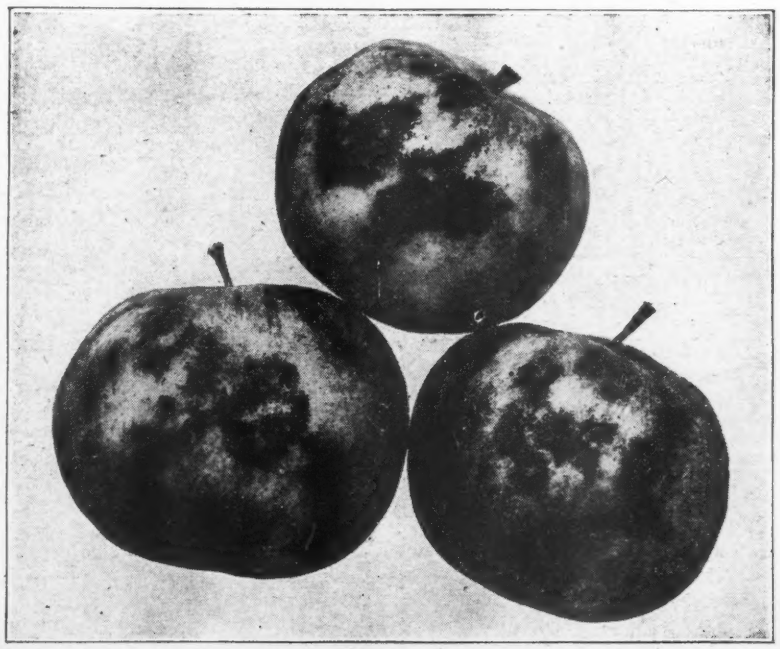
Spray No. 5, Special blotch spray—for severe blotch infection.

Spray No. 6, Second brood codling moth—9 to 10 weeks after spray No. 3.

Spray No. 7, Special.

The season's orchard spraying has an object, which is the control of the diseases prevalent in the orchard, together with the control of the apple codling moth. At times a prolonged early period of unsettled weather, including showery weather, favors the growth of scab on all growth. Spray No. 1b, the pre-pink application of Bordeaux mixture 4-6-50 is very useful at this time and keeps down infection by scab on both foliage and fruit. This spray is needed worst where there is a large hold-over of disease on the fallen leaves and on twigs, and for "frog-eye." It is here used as an extra insurance spray, and is to be made of the same material as spray No. 2, for the diseases Frog-eye, black rot and apple scab as a sanitation precaution.

Spray No. 2, Bordeaux 4-6-50, pre-blossom spray, when cluster buds show pink before blossom opens. This application is timed to meet the young growth and opening clusters of the blossoms. We regard it as the most important spray of the season in disease control. The danger from injury



Blotch on Greening apple

(*Continued on page 14*)

Spray Table for Northern California

By Warren P. Tufts, Assistant Professor of Pomology, University of California

(NOTE: The following material is largely summarized from Circular No. 227 of California College of Agriculture, by Horne and Essig.)

ALMOND

What to Spray For	What to Use	When to Spray	Remarks
Shot Hole Rust	Lime-sulphur 1-10	Just as buds are swelling.	
Calif. Peach Borer	See under "Peach"		
Peach Twig Borer	See under "Peach"		
Red Humped Caterpillar	See under "Prune"		
Red Spider	(1) Lime-sulphur 1 to 10 or crude oil emulsion (2) Lime-sulphur 1 to 50 or sulphur paste 8 to 21 lbs. to 100 gal. water	(1) During dormant season when trees are leafless. (2) As soon as mites appear and as often as necessary during the summer.	(1) To kill eggs of the Bryobia. (2) To kill adults of the Tetranychus.

APPLE

Pear Blight	See under "Pear"		Spraying ineffective.
Mildew	Lime-sulphur 1 to 35 or sulphur paste 8 lbs. to 100 gal. water	When petals fall.	Sulphur sprays cause injury to apple trees in some sections of California.
Scab	(1) Bordeaux 5-5-50 or Lime sulphur 1-20 (2) Lime-sulphur, 1-35	(1) As blossoms open. (2) As petals fall.	Later sprayings may be necessary in coastal sections.
Codling Moth	(1) 2½ lbs. Powdered Arsenate of Lead to 100 gal. water (2) Same strength as No. 1 (3) 2 lbs. Powdered Arsenate of lead to 100 gals. water	(1) As petals fall. (2) Three weeks later. (3) As needed.	In many sections of California two sprays are sufficient. In other locations, 4 or 5 sprays are necessary. Watch for new larvae and spray accordingly.
Flat Headed Apple Tree Borer	Borers only attack sunburned or other dead areas		Spraying ineffective. Whitewash trunks to prevent sunburn.
Fruit Tree Leaf Roller	Miscible or Crude oil spray.	During dormant season, when trees are leafless.	Thoroughly drench limbs, particularly top and outside branches.
Green and Rosy Apple Aphis	(1) Lime-sulphur 1 to 10. (2) Nicotine sulphate ¾ pint. Fish oil soap 4 to 5 lbs. water 100 to 150 gals. (3) 5 or 6% Nicodust.	(1) Late dormant just before buds open. (2) From bursting of the buds until leaf buds are one-half inch long. (3) Same as No. 2.	(1) Fair results in killing eggs. (2) Results in somewhat better control than (1). (3) Dust thoroughly.
Red Humped Caterpillar	See under "Prune"		
Scale Insects	(1) Lime-sulphur 1 to 10. (2) Crude oil emulsion (3) Distillate emulsion (4) Miscible oil.	During dormant season, when trees are leafless.	For San Jose Scale alone Lime-sulphur is sufficient. For a mixed infection of scales use an oil spray, the heavier oils are more efficient.
Tussock Moth	Destroy egg masses during winter. Jar from trees and prevent reascending by banding trees with cotton, wire screen or tanglefoot.		Spraying ineffective.
Wooly Apple Aphis	Distillate Emulsion or Miscible oil.	During dormant season when trees are leafless.	For root form open up around trunk and pour in 4 to 5 gallons of spray. Delicious and Northern Spy roots are somewhat immune. See also under "Peach" Calif. Peach Root Borer.

APRICOT

Bacterial Gummosis	Remove infected areas. Freely disinfect tools and wounds with one part Mercuric Cyanide; 1 part Bichloride of Mercury, 500 parts water.		Spraying ineffective.
Brown Rot	(1) Bordeaux, 8-8-50. (2) Bordeaux, 4-4-50.	(1) When 1-5 of blossoms are open. (2) During full bloom or even after in bad cases.	During fall and winter remove infested twigs and mummies. Sulphur sprays should be avoided, often causing small fruit.
Shot Hole (Peach Blight)	(1) Bordeaux, 5-5-50. (2) Bordeaux, 5-5-50.	(1) After first rains, Nov. 15-Dec. 15. (2) In spring when buds are showing pink.	
Brown Apricot Scale Black Scale	(1) Crude oil emulsion. or Distillate emulsion. or Miscible oil.	During dormant season when trees are leafless, December to February.	Thoroughness of application is necessary.
Calif. Peach Root Borer	See under "Peach."		
Fruit Tree Leaf Roller	See under "Apple."		
Peach Twig Borer	See under "Peach."		
Red Humped Caterpillar	See under "Prune."		

CHERRY

What to Spray For	What to Use	When to Spray	Remarks
Bacterial Gummosis	See under "Apricot."		Spraying ineffective.
Leaf and Fruit Spot (Shot Hole)	See under "Apricot."		
Black Cherry Aphis	(1) Nicotine sulphate 1 pint; fish oil soap 4 to 5 lbs.; 100 to 150 gals. water or dust with 5% Nicodust.	As soon as aphids appear.	Dusting must be thorough.
Cherry Fruit Sawfly	Powdered Arsenate of lead. 3 lbs. to 100 gal. water.	When petals are opening.	
Cherry Slug	(1) Powdered arsenate of lead. 2 lbs. to 100 gals. water. (2) 2 to 5% Nicodust.	When slugs appear.	An easy insect to control.
Pear Thrips	See under "Pear."		
Red Humped Caterpillar	See under "Prune."		

FIG

Smut	No remedy known.		
Souring and Splitting	Due to unfavorable atmospheric or soil moisture conditions.		
Mediterranean Fig Scale	Distillate Emulsion or Miscible oil or Crude oil emulsion.	During dormant season.	

GRAPE

Grape Mildew	Finest forms of dry sulphur.	When new shoots are 6 inches long, and again just before the blossoms open.	In cool or moist locations a third sulphuring when the grapes are as large as peas and a fourth when two-thirds grown.
Calif. Grape Root Worm	Powdered arsenate of Lead. 3 lbs. to 100 gal. water.	As soon as beetles appear in spring.	Cultivate thoroughly close to vines during winter to kill larvae.
Grape Leaf Hopper	(1) Nicotine and soap or, Nicotine sulphate, 1 lb.; liquid soap ½ gal. Water 200 gal. (2) Thoroughly dust with 10% Nicodust.	(1) Before young nymphs develop wings. (2) When adults appear.	In place of 10% Nicodust may use 6% nicosulphur dust which latter will also control mildew.
Grape Phylloxera	Use resistant vines. Disinfect cuttings or rootings before planting by dipping in hot water 122° Fahrenheit for five minutes.		Spraying ineffective.
Mealy Bug	Difficult to control but best results have been obtained by burning sulphur under a tent over the vines.		

OLIVE

Olive Knot	Cut out thoroughly at first appearance and disinfect. Mission variety is more resistant than the Manzanillo and certain other varieties.		Spraying ineffective.
Black Scale	See under "Apricot."	Use distillate emulsion or miscible oil—weaker than for deciduous trees.	

PEACH AND NECTARINE

Blight Leaf Curl	(1) Bordeaux, 5-5-50. (2) Lime-sulphur 1 to 10.	(1) After first fall rains, Nov. 15th to Dec. 15th. (2) Just as buds are showing green in spring.	Peaches cannot be sprayed after leaves appear with these sprays without injury. The fall spray is the most important for Blight; the spring spray for Leaf Curl.
Brown Rot	See under "Apricot."		
Powdery Mildew	See Apple Mildew.		
Black Peach Aphis	Nicotine and soap or dust with 5% Nicodust.	As soon as insects appear.	
Black Scale	See under "Apricot."		
Brown Apricot Scale	See under "Apricot."		
Flat Headed Apple Tree Borer	See under "Apple."		
Peach Rust Mite	Lime-sulphur 1 to 10.	During dormant season.	

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Patents Pending

Spray Table for Northern California—*Continued*

PEACH AND NECTARINE—Continued

What to Spray For	What to Use	When to Spray	Remarks
Calif. Peach Root Borer	Spraying ineffective. Use 1 oz. Paradichlorobenzene to the tree spreading in a ring around the trunk being careful to keep the material 3 inches from the trunk of the tree. Cover with 5 inches of soil mounding around trunk. This remedy should be applied in the early fall before the ground becomes moistened.		Spraying ineffective.
Peach Twig Borer	Lime-sulphur 1 to 10.	As blossoming buds begin to open.	
Red Spider	See under "Almond."		
San Jose Scale	See under "Apple."		
Wheat Thrips	See under "Pear."		

PEAR

Black End	No remedy known. Give good care especially as to drainage.		
Blight	Spraying ineffective. Cut out all affected parts thoroughly. Especially remove all "holdover" in limbs, trunk and roots during the winter. Disinfect tools and cuts freely; Mercuric Cyanide and Corrosive Sublimate one part of each to 500 of water. Keep all suckers and spurs off of root and body. In future plantings, topwork on resistant stocks.		
Scab	Lime-sulphur 1 to 12. or Bordeaux 5-5-50.	(1) Just as cluster buds are opening. (2) Repeat when first blossoms are opening.	Later sprays may be necessary in moist localities.
Brown Apricot and other soft scales	See under "Apricot."		
Cherry or Pear Slug	See under "Cherry."		
Codling Moth	See under "Apple."		
Fruit Tree Roller	See under "Apple."		
Green Apple Aphis	See under "Apple."		
Italian Pear Scale	Crude oil emulsion or Distillate emulsion or Miscible oil.	During dormant season, January or February.	Crude oil emulsions are best. Thoroughly drench limbs and trunks.
Pear Leaf Blister Mite	Lime-sulphur 1 to 10.	November or February.	In most sections the November or early December spray gives greater control than the February spray.
Pear Root Aphis	See under Wooly Apple Aphis under "Apple."		Japanese pear root is more resistant to this pest than the French pear root.
Pear Thrips	Distillate Emulsion 10 gals. Nicotine. 1 pt. Water to make 200 gals. Or dust with 5 or 6% Nicodust repeatedly.	As soon as "black" thrips appear in the blossoming buds as the latter begin to open. Spray as often as necessary.	Carefully watch buds for infestation prior to opening.
Red Humped Caterpillar	See under "Prune."		Treatment for the Italian pear scale will also control San Jose Scale.
San Jose Scale	See under "Apple."		

PLUMS AND PRUNES

Brown Rot	See under "Apricot."		Not often serious.
Scale Insects	See under "Apple and Apricot."		
Calif. Peach Root Borer	See under "Peach."		
Cherry Fruit Sawfly	See under "Cherry."		

PLUMS AND PRUNES (Continued)

What to Spray For	What to Use	When to Spray	Remarks
Citrus Red Spider	See Red Spider under "Almond."		
Flat Headed Apple Tree Borer	See under "Apple."		
Fruit Tree Leaf Roller	See under "Apple."		
Italian Pear Scale	See under "Pear."		
Mealy Plum Louse	6 lbs. fish oil soap to 100 gals. of water.	When insects appear in May and June.	Spraying must be done promptly before leaves are curled. The soap spray appears to give satisfactory results and is cheaper than the Nicotine soap spray.
Peach Twig Borer	See under "Peach."		
Pear Thrips	See under "Pear."		
Red Spider	See under "Almond."		
Red Humped Caterpillar	1. 5 lbs. Powdered basic arsenate of lead-water 100 gal. 2. Dust with dry arsenate of lead, diluted with Pwd. Hydrated Lime.	Whenever insects appear.	This pest is difficult to control. Close hoeing around trunks of tree during fall and spring will kill many hibernating larvae.
Tussock Moth	See under "Apple."		

WALNUT

Blight	No specific remedy. Plant resistent varieties.		
Codling Moth	See "Apple." 1. Basic Arsenate of Lead 3 lbs. to 100 gal. water. 2. Or dust with Powdered Arsenate of Lead and Hydrated Lime.	When the work of the insect is first observed in May and July.	Time of application depends upon climatic conditions.
Red Humped Caterpillar	See under "Prune."		
Walnut Aphis	Dust thoroughly with 2% Nicodust.	Last week of May or 1st part of June.	Sometimes second application is necessary in July or August.
Walnut Blister Mite	Lime-sulphur 1-10.	When buds are swelling in spring.	Not a serious pest.

BUSH FRUITS (Blackberry, Loganberry, Raspberry)

Leaf Spot	1. Bordeaux 5-5-50. 2. Lime-sulphur 1-10.	During dormant season.	Cut out and burn infected parts in fall. Renew old platings. This disease sometimes confused with anthracnose which has not yet been identified in Calif.
Orange Rust	Cut off diseased plantings below surface of the ground and burn. Bordeaux spraying is to prevent infection of healthy plants.		
Raspberry Horntail	Spraying ineffective. Cut off wilted tips as soon as noticed and burn. Remove all dead canes in winter using care to dig out the borers at that time.		
Rose Scale	Distillate Emulsion or Miscible Oil.	During dormant season.	Prune out old canes every year. Pest only serious where pruning is not regularly practiced.

CURRANTS AND GOOSEBERRIES

Mildew	Lime-sulphur 1-33.	As buds commence to open and two or three times thereafter at intervals of ten to fourteen days.	In California use resistant varieties. Lime-sulphur 1-10, followed by a dusting with sulphur when the disease first appears has generally been effective.
Currant and Gooseberry Fruitfly	Spraying ineffective. Cultivate thoroughly during fall, winter and spring months.		
Imported Currant Borer	Spraying ineffective. Cut out and burn all infected canes during the winter and remove the borers.		
Red Spider	Dust with sulphur or spray with wettable sulphur or sulphur paste.	When insects appear.	

STRAWBERRIES

Leaf Spot	Bordeaux 5-5-50	During dormant season.	Clean up and burn leaves in late fall. Spraying necessary only in cases where disease is serious.
Strawberry Aphis	5% Nicodust	When aphids appear.	Apply dust to under side of leaves. Defoliate plants in fall.
Strawberry Crown Moth	Spraying ineffective. Be sure of clean nursery stock. Remove and burn infected plants as soon as discovered.		
Strawberry Leaf Beetle	Established infestations may be reduced by thoroughly spraying with Powdered Basic Arsenate of Lead 3 lbs. to 100 gals. of water, or dust with 1 part of basic powdered arsenate of lead to 4 parts of Powdered Hydrated Lime. It is a severe pest and should be eradicated if possible by destroying all infested vines.		
Red Spider	Thoroughly controlled with dry sulphur. However, this cannot be used on strawberries because of severe burning of the foliage. Very small amount of sulphur in ditches between rows affords some relief.		

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The marked deficiencies of ordinary sprays are the more obvious when it is remembered that the hole made by the newly hatched Codling Moth worm or Curculio on entering the fruit is about the size of a pinhead; the San Jose Scale, Psylla, Thrips, Red Spider, etc., and the eggs of all fruit pests are very small and the spores or "seeds" from which Brown Rot, Scab, Leaf Curl and all other diseases develop are microscopic in size.

Kayso's remarkable value as an adhesive is of no less importance than its efficient service as a spreader. The sticking qualities which Kayso gives sprays largely overcome the losses so frequently resulting from spraying too soon (that is, from spraying before the infection period comes on) or from having the poisons washed off by rains before the infection period is over.

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Apples and peach branches shown here are from actual photographs — the apples sprayed with Arsenate of Lead, and the peach branches sprayed with Lime-Sulfur.

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Spraying Calendar for Rocky Mountain District

By M. C. Merrill, Brigham Young University

What to Spray For.	Treatment.	When to Spray.
Codling Moth.	Arsenate of Lead 1-2 lbs. to 50 gals. water, or 3 lbs. to 100 gals. water. For newly hatched insects make solution stronger, for old or large insects use double quantity.	(1) Spray immediately after petals have fallen (Driving Calyx Spray). (2) Spray ten days later. (3) Spray one month later, 2nd and 3rd sprays should be cover sprays. (Use podwered form of arsenate of lead).
San Jose Scale.	Lime-sulphur, 1 to 8. Or Scalecide, or other miscible oil.	In dormant season, usually before buds open.
Woolly Aphis.	Nicotine sulphate one pint to 100 gals of water; or 15% kerosene emulsion: to either of these add 3 lbs. dissolved soap per 100 gal. Or paint affected parts with pure kerosene or crude petroleum.	Any time when insects appear on the trees. Commonly done in fall after harvest but safer to do so earlier in season.
Oyster Shell Scale.	Concentrated tobacco solution, 2 pints to 100 gals. of water; or 8% kerosene emulsion.	In the spring when the eggs are hatching.
Red Spider.	Clear cold water or concentrated tobacco solution, 2 pints to 100 gals. o water; with either of these use 3 lbs. of dissolved soap per hundred gals.	Summer time when the spiders appear.
Pear or Cherry Slug.	Arsenate of lead, 3 lbs. to 100 gals. of water; white hellebore, 1 ounce to 3 gals of water; Nicotine, 1 part to 800 parts of water.	In spring, or when insects first appear.
Tent Caterpillar.	Codling moth spray controls. Prune egg masses and burn, also burn the tent masses of the caterpillars.	In early spring as soon as found; or just before larvae begin damage.
Fruit-tree Leaf Roller.	Miscible oil during dormant season to destroy egg masses; double strength codling moth spray just as buds are opening.	Miscible oil in early spring or any time during dormant season; arsenate of lead as buds are opening.
Fruit Tree Bark-Beetle.	Keep trees in vigorous condition by cultural methods. Prune out dead limbs and burn.	Pruning best done in early spring.
Peach Tree-borer.	Old method; shield trunks with paper to prevent egg laying. Remove or kill borers with knife or wire. New method; apply paradichlorobenzene to soil at base of trunk, one ounce to each tree.	Paradichlorobenzene treatment during dry weather in early September.
Peach Twig-borer.	Lime-sulphur, one to nine. Arsenate of lead, 3 lbs. to 100 gals. of water.	Just before buds open.. Just as leaf buds are opening.
Buffalo Tree Hopper.	Clean cultivation; destroy weeds and burn pruned wood.	Pruning during early spring; cultivation during early summer.
Grasshoppers.	Use spring tooth harrow on breeding ground; sow broadcast arsenic bran mash where crops are being devoured; mechanical traps also used.	Whenever they appear in numbers
Strawberry Leaf Roller.	Arsenate of lead, 3 lbs. to 100 gals. of water. Repeat this spray.	Soon after adult moths appear. Ten days after first spray.
Pear Leaf Blister Mite.	Scalecide; lime-sulphur 1 to 8; concentrated tobacco solution; 20% kerosene emulsion.	Dormant season, or just as leaf buds are opening.
Currant Fruit-fly.	Destroy or renovate neglected bushes; cultivate soil about plants; allow chickens access to current patch to destroy wormy fruit and larvae.	As fruit develops.
Green Apple-Aphis.	Pruning infested twigs; Tobacco solution, two pint to 100 gallons of water.	Prune in early spring. After eggs hatch and before leaves begin to curl.
Black Peach-Aphis.	Dip nursery stock in strong tobacco solution; spray with concentrated tobacco solution; place tobacco solution or tobacco dust about exposed roots.	When insects first appear on twigs.
Black Cherry-Aphis.	Prune off colony clusters; spray or dip as for black peach-aphis.	Same as for black peach-aphis.
Strawberry Root Aphis.	Scatter straw over plants in early spring and burn. Destroy the ants which nurture the aphis by carbon bisulphide or poison syrup.	Early Spring, after eggs hatch and plant lice appear.
Green Peach-Aphis.	Tobacco solution, 2 pints to 100 gals. of water.	Immediately after hatching and before insects migrate to other plants.
Strawberry Crown-Girdler.	Plow under old strawberry patches; rotate crops.	Fall or Spring.
Green Fruit Worm.	Codling moth . spray.	When spraying is done for codling moth.
Bud Moth.	Arsenate of Lead. Same strength as for codling moth; later sprays stronger	Just before the flower buds open
Apple Leaf Hopper.	Dip nursery stock in soap solution; spray with a tobacco solution on underside of leaves	Early in season before winged stage appears
Thrips.	Nicotine. Repeat as needed.	Just as buds begin to unfold
Flea Beetle.	Spray affected nursery stock with arsenate of lead, 3 lbs. to 100 gals. water	When insect appears
Apple Curculio	Destroy hibernating places and cultivate the soil. Prune orchards and spray with arsenate of lead, 3 lbs. to 100 gals. of water	When insect appears
Plum Curculio.	Eliminate rubbish, destroy hibernating places and cultivate the soil; destroy fallen fruit. Spray with arsenate of lead, 3 lbs. to 100 gals. water	When leaf buds are opening Again after petals have fallen
Putnam's Scale.	Same as for San Jose scale	
European Fruit-Scale	Lime-sulphur, 1 to 8	Dormant season
Round - headed and Flat-headed Apple-tree Borers.	Cutting out with knife or wire, prevent egg laying on trunk by wrapping with paper, protect tree by painting trunk with pure white lead and linseed oil.	Before eggs laid in June and July, and upon appearance of insect.
Fire Blight.	Cut out affected parts, removing cankered branches in dormant season and blighted branches as they appear in spring and summer. Sterilize wound and pruning tools with mercuric cyanide solution. Keep trees free from Red Spider and Aphis and plant resistant varieties.	As disease appears.
Powdery Mildew	Prune and burn affected parts. Lime-sulphur, 1 to 8. Bordeaux Mixture.	As disease appears. In dormant season. In summer as necessary.
California Peach Blight.	Prune and renovate orchard. Lime-sulphur, 1 to 8. Bordeaux Mixture 5-5-50. or Lime-sulphur 1 to 40.	In early spring. Dormant season. In summer as necessary.
Peach Leaf Curl.	Lime-sulphur 1 to 8 or Bordeaux mixture.	Before buds open.
Apple Scab.	Copper sulphate, 4 lbs. to 45 gals. of water or Bordeaux mixture once or twice.	Before fruit buds open.

REMARKS ON SPRAYING CALENDAR FOR ROCKY MOUNTAIN DISTRICT

Codling Moth.—The pdwdered form of arsenate of lead is recommended. If the paste form is used the amount indicated should be doubled. When spraying frequent or constant stirring is necessary. For the cover sprays the casein spreader is recommended. The calyx spray should be applied before the calyx lobes close.

San Jose Scale.—Where trees are old and severely infested and their vitality is low, they should be removed and burned. Because of not having the deleterious action on the skin which lime-sulphur does, scalecide or miscible oils are recommended where they are equally effective as dormant sprays.

Woolly Aphis.—Banding the trunks of the trees to trap the insects as they crawl down to the soil in the fall is sometimes recommended.

Oyster Shell Scale.—Some consider regular dormant sprays applied during dormant season as ineffective to control this insect unless applied when eggs are hatching. Nicotine, 1 quart to 800 quarts of water to which has been added 7 lbs. of soap sometimes recommended.

Red Spider.—Watch out for red spider during unusually dry seasons.

Pear or Cherry Slug.—This insect is doing extensive damage to cherry orchards throughout the Rocky Mountain district. This condition is unnecessary because the insect is very easily controlled.

Tent Caterpillar.—Rarely does serious damage two seasons in succession because of parasites which keep it in check.

Fruit Tree Leaf Roller.—Where miscible oil is used it is commonly mixed in the proportion of 1 part to 15 parts of water. To protect the honey bees spraying with arsenate of lead should not be done while the trees are in bloom. This insect is getting to be a serious pest in parts of the west.

Fruit Tree Bark Beetle.—Some recommend white-washing the trunks and branches, claiming that it prevents the beetles from laying eggs on the trees to some extent, as well as being a value in preventing sun scald.

Peach Tree Borer.—Many favorable reports are being received regarding the effectiveness of the paradichlorobenzene treatment.

Buffalo Tree Hopper.—Doing considerable damage in young orchards in parts of the Rocky Mountain district.

Pear Leaf Blister Mite.—Many growers find it rather difficult to control this pest effectively.

Green Apple Aphis.—Tobacco extract, kerosene emulsion, and soap solutions also recommended.

Strawberry Crown Girdler.—Placing straw on the strawberry patch and burning over the patch is also recommended.

Bud Moth.—Some recommend 4 to 5 lbs. of arsenate of lead to 50 gals. of water.

Apple Leaf Hopper.—When spraying from below with contact sprays, the spray should strike the hoppers.

Apple Curculio.—Worse in thick, unpruned and uncultivated orchards.

Fungus Diseases of the Apple

(*Continued from page 9*)

by Bordeaux is at its lowest when growth is starting, and it is often so accredited when caused by freezing injury of the frost periods. The sanitation service rendered by Bordeaux mixture 4-6-50 is persistent in its effects, and it serves well as a carrier of insecticides.

Spray No. 3 in Ohio practice is one generally made by orchardists, and, owing to the susceptibility of the Ben Davis group to injury from copper sprays at calyx cup, there is a marked tendency to divide lines of practice somewhat upon resistance to these fungicides; while a good many growers employ this as an early spray to make Bordeaux applications for blotch control, and they may show a similar disposition for Phoma fruit spot. It is this situation which marks the present importance of spray No. 4, or two weeks spray. The name indicates its approximate placing,—two weeks or a little later, than the calyx cup, or spray No. 3. Bordeaux No. II is used for this application with the addition of arsenate of lead, or other arsenicals. It is a critical time for the control of mid-summer diseases, such as apple blotch, apple scab and notably forms of black rot (Frog eye) and the care of the new Phoma fruit spot.

Spray No. 5, named here "special blotch sprav" will be called for enforcing partial blotch control through the well timed application expected to be made about 2½ weeks after spray No. 4. It is understood in these names and numbers applied to sprays that the practice of growers will be modified according to their disease infection and their successful experience. The real object is to use such expressions as will be recognized as important applications to the trees, of which the next one is very important. This spray may be omitted in absence of severe infection.

Spray No. 6, second brood codling moth, 9 to 10 weeks after spray No. 3, Bordeaux mixture 2-4-50 formula, plus arsenate of lead, is for apple blotch, bitter rot, apple scab, sooty fungus, codling moth and Phoma fruit spot. The developments of the present season show that following this application where we have serious conditions of late season infection, an additional application of spray No. 7 of the same material will be called for to control the late season fungous parasites, and the need will sometimes be extremely urgent. These include sprays for the sooty fungus, black rot, bitter rot, apple blotch and Phoma fruit spot, with required insect control arsenicals. We have called this a "special spray" or sprav No. 7, and we have found the time for its application to be the third to fourth week in July in southern Ohio, and late July or early August in northern Ohio.

I am under special obligations to Roy C. Thomas, Asst. Botanist for his findings as to Phoma pomi on Ohio apple fruits in 1922. A. D. S.

Nebraska Meeting

EVERETT H. GOOD, who attended the Nebraska meeting, tells us that the session was a great success. The exhibit was one of the finest ever held by the Society, the remark often being heard that the fruit looked like it came from Oregon. A subject in which all showed keen interest was "What varieties are adapted to my locality?" This subject was handled by Dr. N. E. Hansen of South Dakota. President Arthur J. Weaver told of the difficulties experienced by the pioneer horticulturists. The Association is recommending for publication a small pocket manual which will give information on varieties to those who are contemplating growing fruit in Nebraska.

A concerted effort is going to be made to secure more plantings in the middle west. Statistics show that Nebraska alone has now only about one million bearing trees where in 1910 it had three million.

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A Spray Calendar for Southern California

By R. S. Vaile

The important diseases and pests that affect commercially grown trees

APPLES

What to Spray For	Treatment	When to Spray	Remarks
Codling Moth	6 lbs. dry basic Arsenate of Lead to 200 gals.	(1) When most of petals have fallen. (2) Just after blossoms fall. (3) 8 to 10 weeks later.	Thoroughness is the essence of codling moth spraying.
Wooly aphis Purple aphis. Green aphis. San Jose Scale.	Miscible oil or oil emulsion with Black Leaf "40."	Dormant season.	As late as possible if aphis are present. San Jose Scale is found on all deciduous trees but is seldom injurious in southern California.
Apple Scab.	Bordeaux.	As soon as cluster buds open	
Powdery Mildew.	Lime-sulphur sol or Atomic sulphur.	In spring.	Combine with (2) Codling Moth spray.

APRICOTS

Brown Apricot scale. Black scale.	Miscible oil or oil emulsion.	Dormant season.	
Shot hole fungus. (Calif. Peach blight)	Bordeaux.	Early fall.	Before heavy rains.
Brown rot.	Bordeaux.	Early fall.	

ALMONDS

Red Spiders (mites).	Lime-sulphur sol or atomic sulphur, or dry lime-sulphur.	Dormant season. Late spring.	Generally successful.
Shot hole fungus. (Calif. Peach blight.)	Bordeaux.	Early fall.	A "second bet" when needed.

GRAPES

Leaf hopper.	20 lbs. atomic sulphur and 1 pt. black leaf 40 to 200 gal. tank.	May to July.	
Mildew.	Dust with flowers of sulphur.	(1) When shoots are 8 to 10 inches. (2) When fruit is size of buckshot.	
Mealy bug.			Not usually treated for in southern California.

CITRUS FRUITS (Oranges, Lemons, Pomelos)

Scales. Black Citricola Red and Yellow. Purple.	Fumigation generally recommended over spraying. Several proprietory miscible oils are occasionally used. Time of treatment—June to January.		
Mealy bug.	Now controlled almost entirely by natural enemies. Argentine ants must be kept away from trees, if natural enemies are to do their work properly.		
Red spider, (mites.)	Lime-sulphur sol or Atomic sulphur dust.	Whenever mites appear.	Natural enemies are now generally efficient near the coast.
Thrips.	Nicotine.	Blossoming time.	May sometimes be combined with red spider control. Required only in interior.
Brown rot.	Bordeaux.	Fall or early winter.	Usually required only on lower branches of lemons.

OLIVES

Black scale.	Miscible oil or crude oil emulsion.	As early in winter as fruit is off the trees.	Olives will not stand full strength of dormant oil sprays.

PEACHES

What to Spray For	Treatment	When to Spray	Remarks
Scales Black and Brown.	Miscible oil or crude oil emulsion.	Dormant season.	Not generally severe on peaches.
Peach leaf curl.	Lime-sulphur solution.	When buds are swelling.	Dormant spray for blight may be enough.
Calif. Peach blight.	Bordeaux.	Dormant season.	

PEARS

Thrips.	Nicotine.	As the blossom buds are opening.	
Red Spider (mites)	Lime-sulphur solution or atomic sulphur.	When mites appear.	Often dormant oil spray will control mites.
Codling Moth.	See under "Apple."		
Pear Blight.	Spraying not generally effective.		

PRUNES

Brown Apricot Scale.	Miscible oil, or crude oil emulsion.	Dormant season.	
Mealy Plum Louse.	Nicotine.	Just after petals have fallen.	The oil spray for scale may control aphis if applied just after harvest or just before blossoming.
Red Spider (mites)	Lime-sulphur dust, lime sulphur solution or atomic sulphur.	Whenever mites appear.	

WALNUTS

Codling Moth.	As for apples.	May 25 to June 20.	When both codling moth and aphis are present, add 1 pt. Nicotine.
Aphis (when codling moth is not present).	Nico-dust.	May or June.	
Red Spider (mites).	Flowers of sulphur and hydrated lime 3 to 1.	When mites appear.	

SMALL FRUITS

Mildew.	Flowers of sulphur dust.	Early in spring.	
Strawberry Leaf-spot.	Bordeaux.	Just before or just after blossoming.	
Aphis.	Nicotine.	Whenever they appear.	
Red Spider (mites).	Sulphur.	Whenever they appear.	

Peach twig borers attack many of the deciduous trees occasionally. Special spraying for them is seldom practiced. Dormant oil spraying seems to be beneficial in their control.

Flat-headed borers attack many of the deciduous fruit trees. Spraying does not control them. They must be dug out, whenever found. Clean, healthy trees are seldom attacked.

There is a tortrix worm that occasionally does some damage to oranges, but special control measures are not employed.

Woolly aphis attacks both apples and pears, and occasionally other deciduous trees. The aerial forms may be controlled as are other aphis, but the root forms are much more difficult to combat. There is no proven, economical method of control on old trees.

Strength of Materials to Use

Bordeaux—
for fall or dormant deciduous spraying, 5-5-50
or Bordeaux powder, 18-20 pounds to 200-gallon tank.
for spring deciduous or any citrus spraying, 2-2-50
or Bordeaux powder 8-12 pounds to 200-gallon tank.

Lime Sulphur Solution—
20 gallons to 200-gallon tank for all purposes listed, except in hot weather reduce on citrus to 15 gallons.

Atomic Sulphur—
20 pounds to 200-gallon tank for all purposes listed.

Nicotine—
1 pint to 200-gallon tank. 3 gallons of liquid soap is an aid as a spreader.

Miscible Oil—
Several proprietary preparations for which the formulas vary.

Crude Oil Emulsion—

Crude oil (21—24)	25	gallons.
Liquid soap	3	"
Water	175	"

Diseases and Insect Injuries of the Sour Cherry

By Leon K. Jones

COMMERCIAL cherry growing in Wisconsin is a very young industry, the increase in acreage of this fruit being largely due to the rapid development of fruit-growing on the Door County peninsula. About thirty years ago A. L. Hatch, a Wisconsin nurseryman, and Prof. E. S. Goff of the Agricultural Experiment Station became interested in the possibilities of the peninsula for fruit growing. Inasmuch as the large bodies of water lying on either side of the peninsula served to moderate the temperature of the air, and because the soil was of limestone formation, they believed that this section should be peculiarly adapted to fruit growing. Accordingly, they initiated trial plantings of cherries and other fruits in the vicinity of Sturgeon Bay. From this start the cherry industry has grown rapidly, until the present plantings on the peninsula cover about 2,500 acres, with an annual output valued at more than a million dollars. Among these plantings is an orchard of 700 acres, possibly the largest sour cherry orchard in the world. The Montmorency and Early Richmond, are grown almost entirely, while the sweet cherry has not proven profitable largely because of its susceptibility to winter injury.

It was soon found necessary to develop thorough control measures to combat diseases and insects that were menacing the industry. At first the spraying was done with hand pumps and barrel outfits. Today, however, nearly every grower has a modern power sprayer. Owing to the scarcity of labor during the last few years spraying has developed into an art, each grower trying to obtain the maximum of spray delivery with the minimum of labor. It is therefore not unusual to see in the large orchards high powered spray outfits that maintain 300 pounds pressure on three guns.

Leaf spot is the most important cherry diseases in Wisconsin, and would be a limiting factor in the growing of cherries if thorough control measures were not practiced. Brown rot, which is present to a limited extent, has never caused serious injury. The cherry aphis causes more damage than any other insect, although the cherry slug often causes serious injury. The plum curculio is distributed over the state, sometimes causing injury to farm and home orchards. However, in commercial orchards the regular spray program for the control of cherry leaf spot has proven sufficient to control the ravages of this insect.

Cherry Leaf Spot

This disease is caused by a fungus which lives in the diseased parts of the cherry plant and passes the winter in the dead leaves on the ground. In the spring it produces spores ("winter spores") which are shot into the air from the spore-bearing bodies on the leaves. Some of these spores lodge on the living cherry leaves. Here they germinate, grow into the leaf and produce the diseased spots. On the under surface of the reddish brown spots small "blisters" usually develop. These break open, and a whitish material oozes out. This is made up of thousands of spores of another type ("summer spores") which spread the disease during rains throughout the summer. Fruit and pedicels may also be attacked, but seldom is this type of injury serious. The badly affected leaves ordinarily turn yellow and drop. Oftentimes this dropping of the leaves causes the tree to become defoliated before harvest. The brown diseased spots on the leaves may drop out, and on account of the resulting appearance of the leaves the disease has often been called "shot hole." In cases of

(*Continued on page 28*)

TREE TANGLEFOOT

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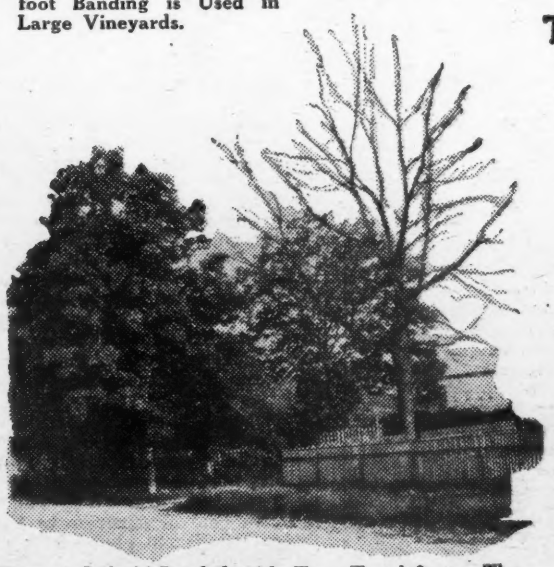

Tree at Left is Banded with Tree Tanglefoot. The One at the Right was Not Protected. Notice that Insects have Completely Defoliated It.

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Dusting Calendar

By W. C. Dutton, Michigan Agricultural College

The Dusting Calendar is given for the benefit of those growers who wish to use the usting method for all or part of the summer applications. If the spraying method is o be used for part of the applications, it is suggested that such applications be made t the periods for which a choice of dusting and spraying materials is offered, as for he pre-blossom applications on apples and pears.

APPLES

Application	For	Materials
1) Dormant.	Scale insects.	Any standard material for dormant spraying.
2) Prepink. Just before blossom buds begin to separate in the clusters.	Apple Scab.	Lime-sulphur solution, 1¼-50, superfine sulphur dust or dehydrated copper sulphate dust (15%).
3) Pink or cluster. Just after buds have separated in the clusters.	Apple Scab and certain chewing insects.	Lime-sulphur solution, 1¼-50, plus 1 to 1½ lbs. lead arsenate powder, 90-10 sulphur lead dust or dehydrated copper sulphate dust (15%) with 10% lead arsenate.
4) Calyx application. Just after petals have dropped.	Apple Scab, codling moth and other chewing insects.	85-15 sulphur-lead dust.
5) Ten days after (4).	Apple Scab, codling moth and other chewing insects.	85-15 sulphur-lead dust or dehydrated copper sulphate dust (15%) with 10 to 15% lead arsenate.
6) Ten days to two weeks after (5).	Same as (5).	90-10 sulphur-lead dust or dehydrated copper sulphate dust with 10% lead arsenate.
7) Eight to ten weeks after (4). Each time must be determined locally according to emergence of the second brood of codling moth.	Codling Moth and apple scab.	85-15 sulphur-lead dust or copper sulphate dust with 15% lead arsenate.
8) Three to four weeks after (7).	For codling moth in seasons or in districts where injury by this insect is apt to be severe.	Same as (7).

NOTE—If aphids or red bugs are present, nicotine sulphate should be with the spray or ust in the "pink application" and usually again in the dust at the "calyx application."

PEARS

) Dormant or	Scale insects.	Lime-sulphur solution, 6¼-50 or other standard dormant spray.
) Delayed dormant, if pear scab or pear psylla are present. Just before blossom buds begin to separate.	Scale insects, scab, psylla eggs and blistermite.	Lime-sulphur solution, 6¼-50. Spray very thoroughly to insure covering all psylla eggs.
) Pink or cluster application. Just after blossom buds have separated in the cluster.	Pear scab.	Bordeaux, 3-6-50 formula, superfine sulphur dust or dehydrated copper sulphate dust (15%).
) Calyx application. Just after petals have dropped.	Pear scab, codling moth.	90-10 sulphur lead dust or dehydrated copper sulphate dust (15%) with 10% lead arsenate.
) Ten days to two weeks after (3).	Same as (3).	Same as (3).
) Two weeks after (4).	Pear scab.	Sulphur dust or dehydrated copper sulphate dust (15%).
) Same time as determined for No. 7 on apples. On varieties very susceptible to scab or in seasons favorable to codling moth development.	Pear scab and codling moth.	90-10 sulphur lead dust or dehydrated copper sulphate dust (15%) with 10% lead arsenate.

NOTE—If pear psylla are present during the summer, their numbers may be reduced, when the adult form, by a thorough application of a 2 to 2½% nicotine sulphate dust.

PEACHES

Application.	For	Materials
(1) Dormant. Late fall or very early spring.	Leaf curl and scale insects.	Lime-sulphur solution, 6¼-50.
(2) Just as the last of "shucks" are falling.	Curculio and Brown Rot.	80-10-10 sulphur-lead-lime dust.
(3) Two weeks after (2).	Curculio and Brown Rot.	Same as (2).
(4) About one month before harvest.	Brown Rot and Peach Scab.	Superfine sulphur dust alone or diluted with 10% of hydrated lime or other inert material.
(5) One week to ten days before harvest.	Brown Rot and Peach Scab.	Same as (4). This is of particular value on varieties susceptible to Brown Rot in reducing the development of rot both before and after harvest.

NOTE—This schedule is adapted to districts where curculio is controllable without great difficulty. In the southern districts where curculio is a serious menace, it will probably be desirable to make more frequent applications early in the season and to reduce the proportion of lead arsenate because of possible injury to foliage.

CHERRIES

(1) Dormant. This is not necessary on sour cherries.	Scale insects.	Lime-sulphur solution, 6¼-50 or other standard dormant spray.
(2) Just before blossoms open.	Curculio, Leaf Spot and Brown Rot.	Dehydrated copper sulphate dust (20%) with 10% lead arsenate.
(3) Just after petals drop.	Same as (2).	Same as (2).
(4) Ten days to two weeks after (3).	Same as (2).	Same as (2).
(5) Two weeks after (4).	Brown Rot and Leaf Spot.	Dehydrated copper sulphate dust (20%)—(without poison).
(6) Soon after fruit is harvested.	Leaf-spot.	Same as (5).

NOTE—If conditions have been very favorable for brown rot development, application 5 can be profitably repeated about one week before harvest.

PLUMS

(1) Dormant.	Scale Insects.	Lime-sulphur solution, 6¼-50 or other standard dormant spray.
(2) Just before blossoms open. This is the least important of all the applications.	Brown Rot and Curculio.	Dehydrated copper-sulphate dust (20%) with 10% lead arsenate.
(3) Just after petals have dropped.	Brown Rot, and Curculio and Leaf-spot.	Same as (2).
(4) Two to three weeks after (3).	Same as (3).	Same as (2).
(5) About one month before harvest.	Brown Rot and Leaf-spot.	Dehydrated copper-sulphate dust (20%). If Curculio is prevalent at this time the poison should be added.
(6) One week to ten days before harvest.	Brown Rot.	Sulphur dust or dehydrated copper sulphate dust.

NOTE.—For Japanese varieties of plums it will be safer to follow the summer schedule recommended for peaches.

GRAPES

(1) When shoots are 6-10 inches long.	Black Rot and Mildew.	Dehydrated copper-sulphate dust (20%).
(2) Just before blossoms open.	Black Rot, Mildews, Berry-moth, and other chewing insects.	Dehydrated copper-sulphate dust (20%) with 10% lead arsenate.
(3) Just after blooming period.	Same as (2).	Same as (2).
(4) Two weeks after (3).	Same as (2).	Same as (2).
(5) Ten days to two weeks, or just before the berries touch in the bunches.	Specially for Berry-moth, also for rot, etc.	Same as (2).

NOTE.—If leaf-hoppers are present an application of nicotine dust should be made just before the oldest nymphs develop wings. This will probably come about the time of Application No. 4. If the nymphs continue to appear, as they probably will if weather conditions are favorable, the application of nicotine dust should be repeated in about two weeks.

Spreaders in the Poison Spray

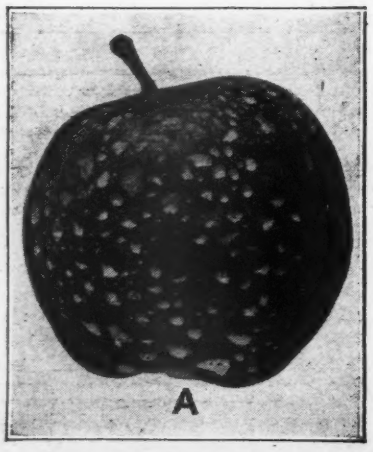
By A. L. Lovett, Entomologist, Oregon Experiment Station

THE general use of a spreader in the poison spray solution is of comparatively recent development. No sweeping generalities regarding the effectiveness or limitations of spreaders are possible. Opinions vary regarding their value. Experimental data are inadequate and somewhat contradictory. In general we may state that the interest in the use of spreaders is widespread among growers and that the trend of opinion and experimental data are favorable to the use of spreaders in the poison spray solution.

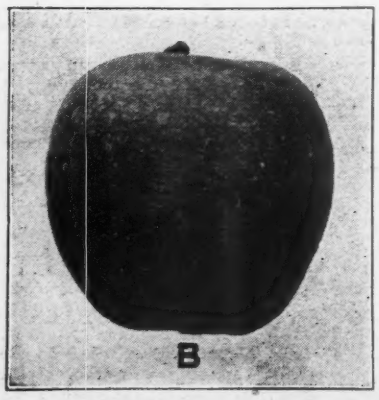
It is to be regretted that careful investigational work has not been completed on a variety of perplexing points regarding spreaders, on which there is such a difference of opinion. Probably at the present time the principal material prepared commercially and recommended generally for use as a spreader is the casein spreader or caseinate.

Oil emulsions, soaps and glues have a limited usage as spreaders, but will not be considered in this paper. In the earlier studies of spreaders, at the Oregon Station, the oil emulsions were accorded second position and all evidence points to a definite field for the effective use of oil spreaders in the near future. One point is to be emphasized, however,—the casein spreaders are of fairly universal usage. It is the exceptional spray where their use is inadvisable. Practically all other materials adaptable for use as spreaders are, on the other hand, inadvisable for universal application, having especial merit for some rather definite spray solution.

There are a number of improvements desirable in our use of poison sprays. To what extent does a spreader supply these needs? For convenience we will discuss them under definite headings as follows:



When no spreader is used



When a spreader is used

Spreader and Spray Efficiency

Does the Addition of a Spreader to the Poison Spray Solution Increase Its Efficiency? Opinions and evidence are by no means united on this point. Practically without exception where experimental field spraying has been done in the West we have employed high powered, big capacity outfits in the hands of trained manipulators. With the abundance of solution used and the fog like spray afforded, the comparative results favorable to the use of spreaders rapidly diminishes. Contradictory evidence is by no means lacking and in a number of cases the plats sprayed without a spreader show a worm control superior to that obtained in adjacent plats where spreaders were used.

For the vast majority of the commercial orchards, however, where moderately efficient outfits are employed in

(Continued on page 30)

Important Factors In Good Spraying

(*Continued from page 3*)

the lower portions of the trees and very poor control in the tops. In one experiment, we found 3.5 percent damage in that portion of the tree from the ground to twelve feet and 17.8% damage above this point. Generally speaking, providing thorough, well timed spraying has been done, there are two reasons, either one of which would bring about the above type of control. The average 1½ horse power outfit has a pumping capacity of not to exceed four or five gallons of spray per minute and the pressure that it can maintain is limited, probably not more than 200-225 pounds on the average, without killing the engine. The grower then follows one of two courses, he either cuts down the size of the disc in his spray gun in order to get a finely divided spray or he uses a fairly coarse spray in order to keep his engine running and in order to finish his job in a hurry. Both of these combinations will bring about the degree of worminess cited above. The reasons are these: where the fine disc is used and the fine spray employed from a small outfit, the discharge is very limited, 1 to 3 gallons per minute. The operator's working radius is materially decreased, and the output from the gun reduced. The sprayer salesman says "sure, this rig will hold 300 pounds pressure and will operate two guns." However, if one will put the nozzle in a milk can and measure the discharge, it will be seen that capacity and with it, working radius has been sacrificed for the 300 pounds pressure. This set of conditions is productive of very poor results unless extreme care in spraying is practiced, an act not yet learned by a large percentage of fruit growers of the country. I am firmly convinced after carrying on numerous tests and observing many growers operating two guns on 3½ horse power outfit that herein lies their trouble and a set of conditions which had not been favorable to the use of the spray gun. To growers who must use this type of outfit, my advice is, use one gun only, employ a disc in the nozzle through which about five gallons of spray is discharged and try to keep the pressure as near 300 pounds as possible. Go back to the rods if your sprayer can not be made to meet these conditions.

High Power With Gun

The spray gun was first made to be a part of a high powered outfit, and there it rightfully belongs. Adaptation to small outfits was not in the minds of the originators of the spray gun and the orchardist who has used it with poor success, should in all justice to the spray gun, shoulder the blame. Our Station began testing one of the new high pressure machines for our various apple orchard ailments shortly after their first introduction. Right from the start the gun has given a good account of itself. This larger outfit, taking into consideration its greater cost, can be operated just as economically as the smaller rigs and at the same time cutting the actual spraying time nearly in half, thus making available much time for orchard work other than spraying. It has been found no more wasteful of materials, in fact we have much information that leads us to believe that it is less wasteful of spray materials, than small outfits when the spray is applied with experienced gunmen. In our experimental work, results in controlling Codling Moth, have in most cases been superior to that obtained with the spray rods. The control of other orchard troubles obtained by orchardists using high powered outfits has been more complete with the gun than was obtainable with the rods. The work has been more thorough and much more speedily accomplished.

A good gunman can use five to six

(*Continued on page 21*)

The Car for the Woman On the Farm

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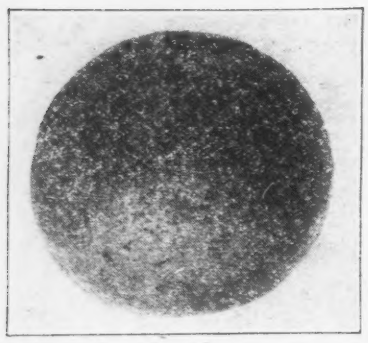
Leading Insect and Disease Pests of Florida



Scaly bark fungus on fruit

covers it in the latter stages with a wool like covering. The other species are of little importance. There are three main broods of white flies a year, occurring about March, June and September.

The Purple Scale

(Lepidosophes beckii) which is closely related to the oyster shell bark louse which attacks the deciduous fruit trees of the North, is the most serious scale pest and it ranks second in injury done to citrus. The Long Scale a closely related species is usually found in small numbers associated with the purple, and differs from it mainly in being longer and narrower. The Round Scale is larger than either but is covered with a scale formed of wax and moulted skins embedded therein as are the others. All of these lay their eggs under the scale covering where they hatch; then the young crawlers come out and soon find a desirable location on leaf, twig or fruit; settle down, insert their sucking tubes and remain fixed for life.

Melanose on fruit

Gummosis on trunk

WHITE FLY. There are eight species of white fly that may be found on citrus. The common or mealy winged (Dialeurodes citri) is the most important, and serious insect pest found. The adult is a tiny moth, incorrectly called a fly. The eggs are deposited on the underside of leaves, often to the number of several thousand on a single leaf. The eggs hatch in from ten to twelve days, the young crawl around for a few hours then settle down insert their sucking mouth parts into the leaf and remain fixed for thirty to fifty days, undergoing four moults before reaching maturity. They lie closely pressed against the under surface of the leaves, and live and act much like scale insects, though they have no scale covering. The cloudy winged species (Dialeurodes citrifolii) is so similar to the mealy winged that it is not easy to distinguish from it. The name suggests the difference in the adult. The woolly species gets its name from curled wax filaments secreted by the larva, which completely

In addition to these armored scales, there are some unarmored which have a thin waxy coating on the skin or incorporated in it, as the turtle-back, hemispherical and barnacle. These are of little importance in Florida though to this group belongs the black the worst scale pest of California.

The mealy coated scales include mealy bugs, and cottony cushion which sometimes become sufficiently numerous to make control measures necessary.

There are three main broods a year of scales as of white flies, occurring about the same time.

Parasitic Fungi

During the warm moist conditions that prevail in Florida during the rainy season of July and August many forms of fungi thrive. Some minute parasitic species of which attack the larvae of white fly and scales, their fixed position giving opportunity for the sprouting of the spores and de-

Spray Calendar for Florida Fruits

By W. L. Floyd, University of Florida

For Grape Fruit and Satsumas

Pest	Time	Remedy	Remarks
Scab. Melanose	March or April. Soon after petals have fallen.	Bordeaux-oil Mixture. Make 3-3-50 Bordeaux, add concentrated oil emulsion to give 1% of oil to mixture.	Important for preventing and checking these diseases on tender growth.

For All Species of Citrus

White Fly. Scale Insects. Rust mites.	May. When fruit is one inch in diameter.	Oil emulsion diluted to contain 1 part oil to 99 parts water, then add 2½ lbs. dry soda-sulphur to 100 gals.	Oil emulsion sometimes injures small fruit, it should be one inch or over in diameter to be safe.
Rust mites. Red Spiders.	June. During dry weather.	Dust with Flowers of Sulphur, or spray with Lime-Sulphur, 1 gal. to 50 gals. water.	Watch for mites. Apply before they become numerous.
White Fly Scale Insects	Early in July. After rainy season begins.	Parasitic Fungi. Red Aschersonia. Red-headed fungus.	Dissolve spores off in water, strain and apply with a clean hand sprayer. If obtainable add spores of Brown, Gray-headed and Black fungi.
White Fly. Scale Insects. Rust mites.	October or November	Oil Emulsion in which Soda-Sulphur is dissolved.	Same proportions as given in 2nd.

Special Spraying Not Usually Necessary Under Normal Conditions

Scab.	Early February. Before new foliage unfolds.	Bordeaux-oil mixture.	Same as 1st on Grape fruit and Satsumas where much scab is present. Important on young non-bearing trees. Prune out diseased parts as much as possible before spraying.
Thrips.	March. When about ½ the petals have fallen.	Nicotine Sulphate with Lime-Sulphur. Use 13 oz. Nicotine Sulphate and 2½ gals. Lime-Sulphur to 100 gals. water. More often necessary on Satsumas.	Apply when 25 or more thrips are found to the blossom.
Rust mites. Red Spiders.	August or September. When mites become noticable.	Dust with Flowers of Sulphur, or Spray with Lime-Sulphur 1 to 50.	Watch for mites if weather becomes dry. Apply before they become numerous.

For Avocado

Pest	Time	Remedy	Remarks
Scab. (Cladosporium Citri). Black Spot. (Colletotrichum sp). Blotch. (Cercospora sp).	March. (1) Latter part of blooming period. (2) 3 weeks later. (3) 3 or 4 weeks later.	3-3-50 Bordeaux Mixture.	Three sprayings are usually sufficient, though a fourth may sometimes be necessary.
Scale Insects. White Fly.	October. As foliage begins to harden. Repeat in December.	Oil Emulsion, 1 to 70.	Alternate this with spraying for thrips, lace bugs and spiders, when they are present.
Leaf Thrips. Lace Bugs. Red Spiders.	November to March, when pests are found.	Lime-sulphur 1 to 60 plus 40% Nicotine Sulphate 1 to 900.	Alternate with spraying for scale insects and white fly.
Flower Thrips. Blossom Anomala. Leaf Roller.	Early March when in bloom if pests are found.	40% Nicotine Sulphate. 13 oz. to 100 gals. water, then add Fish oil soap 2 lbs. arsenate of lead 3 lbs.	Unless Thrips are numerous omit Nicotine Sulphate and soap.

For Mango

Anthracnose (Collelotrichum gloeosporioides). Blossom Anomala.	March. When in bloom.	3-3-50 Bordeaux Mixture. 1½ lbs. Arsenate of lead.	
Red Spiders. Leaf Thrips.	November to March when pests are found.	Lime-Sulphur, 1 to 60 plus 40%. Nicotine Sulphate, 1 to 900.	Repeat as often as necessary.
Scale Insects.	December to February. When trees are dormant.	Oil Emulsion, 1 to 70.	Alternate this spraying with one for Spiders and Thrips. Two or more sprayings may be necessary.

For Pineapple

Soft Rot. Thielaviopis paradoxa).	Fruit after ripening	Careful handling. Packing only when dry. Prompt shipment.	Sometimes severe among pineapples in transit.
Red Wilt. (Caused by nematode).	Six to eight weeks before setting plants.	Breaking soil deep then applying calcium cyanimid, 1 ton to acre.	Too expensive for general use.
Red Spiders. Mealy Bugs.	In periods of dry weather.	Handful of tobacco dust in bud of plant.	

Important Factors

(*Continued from page 19*)

gallons of spray a minute. Following a careful investigation of the subject of disc openings in the gun, pressure and the economics of operation of a good standard spray machine, we have concluded that 1st: A spray machine should have sufficient power and pumping capacity to pump at least six gallons per minute for each gun employed and still possess a fair overflow. 2nd: A pressure of at least 300 pounds should be maintained running up as high as 350 pounds. 3rd: Disc openings of ⅛ inch and 9-64 inch in the guns permitted the passage of 5.72 gallons and 6.62 per minute, respectively at the above pressure when operated wide open. 4th: This amount of discharge permitted the covering of the higher portions of the trees with a finely divided spray because of the volume that was being discharged at high pressure. 5th: Openings of this size can not be used to advantage at lower pressures on small outfits as the spray becomes coarse and stream like and not so effective for the control of most of our orchard pests.

The ideas that are included in this article are no longer theory. Growers are practicing them with marked success. If you, as a fruit grower, are having much trouble, reorganize your spraying compaign along these lines and you will soon be well on the road to a satisfactory solution of your spraying problem.

Enemies of the Peach

(*Continued from page 8*)

plums and peaches. Some are less familiar with the fact that it may cause the death or "blighting" of the flowers and induce twig and branch killing upon the peach. It was formerly supposed that the disease was entirely carried over from one year to another upon the dried rotted fruits or "mummies" but it has recently been learned that cankers upon the twigs are also a prominent source of reinfestation. The disease is most serious in hot, humid districts but occurs quite generally throughout the peach regions of the world.

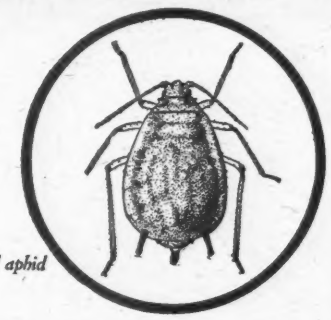
It was a most troublesome disease to control previous to the discovery of self-boiled lime sulfur about 1908 and losses of entire orchard crops just at ripening time were not uncommon in the south. Previous to that time we had no effective fungicide that was safe to use upon peach foliage in humid climates. The copper sprays such as Bordeaux mixture are likely to cause serious defoliation and concentrated lime sulfur has also proved dangerous to use. Peach scab or black spot occurs quite generally in humid peach regions and since its control is largely associated with that of brown rot it will be so treated in this discussion.

Peach Scab

This fungus attacks the fruit, leaves and twigs of the peach but the chief economic damage is to the fruit. It appears in the early part of the growing season as minute greenish black specks upon the uppermost surface or end of the fruit. These spots enlarge and often coalesce so that the upper surface of a mature fruit may be nearly covered with black spots or even present a uniform sooty appear-

(*Continued on page 31*)

February, 1923



Drawing of greatly magnified aphid

This is the last of a series of six advertisements on the making of better orchards. Reprints of the entire series will be sent to you upon request. Write for them today.

Spray for Aphis Just As Buds Show Green

With the hatching of the eggs early in the spring, the cycle of aphis propagation starts. And, unless control is secured then, multiplication follows at a rate that makes control increasingly difficult as the season advances. Every aphid hatched in the spring, if allowed to live, starts a prolific succession of progeny. The application of SCALECIDE as *your* delayed dormant spray means "nipping trouble in the bud". The Mass. Exp. Sta. Bul. No. 184 shows SCALECIDE to be 100% efficient in killing aphis while hatching. And, this, without the addition of nicotine or anything else.

While the delayed dormant spray can kill only the first brood, unless aphis are controlled at that time they will cause the foliage to curl, and the protection thus afforded makes effective spraying of the later brood almost impossible. Furthermore, the delayed dormant spray is necessary to protect the young fruit from the first brood. If ants carry in a later brood, SCALECIDE as the delayed dormant spray, will have insured a healthy growth of the terminals before this later brood can do serious damage.

Let SCALECIDE be your dormant spray. Then you will know that you have done all that can be done *at that particular* time by any dormant spray or combination of sprays. Fall spraying with SCALECIDE controls pear psylla and peach leaf curl. Spring application controls aphis, pear thrips, leaf minor, case bearer and leaf roller. *Either* fall or spring spraying with SCALECIDE controls scale, bud moth, European red mite, fungus or blight cankers from which are spread fire blight, collar rot and root rot. And in addition to controlling these insects and diseases, year after year use of SCALECIDE invigorates the trees.

WE GUARANTEE that, if you will divide an orchard, your worst or best, in two parts equal in general condition, and for three years spray one part with SCALECIDE according to our directions and the other part with lime-sulphur, giving the same summer treatment to both parts, the part sprayed with SCALECIDE will be better than the part sprayed with lime-sulphur—in the judgment of three disinterested fruit growers—or we will refund the money you have paid for the SCALECIDE.

If your dealer doesn't carry SCALECIDE, show him this advertisement—or order direct from us. In any event, write today for the new booklet, "Why SCALECIDE". We will send you also "Spraying the Home Garden", which is considered one of the most helpful treatises extant on the control of insects and diseases that attack trees, shrubs, vines, flowers and vegetables. Address Dep't 11

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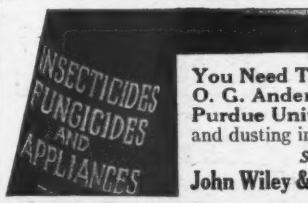

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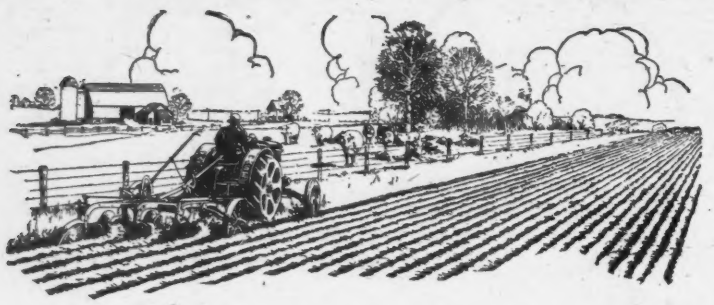

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Apple Blister Canker

By H. W. Anderson

University of Illinois

IN SPITE of adverse criticism from many sources the Ben Davis apple continues to be the leading variety in the apple growing states of the Mississippi valley. About one-third of the apples produced in the States of Indiana, Illinois, Missouri, and Arkansas are Ben Davis. Therefore, any disease which affects this variety is of great economic importance.

Blister canker is primarily a Ben Davis disease although it occurs on almost all other varieties to some extent. Orchards of this variety from 15 to 30 years of age invariably show the affects of the canker. In orchards between 15 and 20 years an average of 10% infected trees may be expected. This increases rapidly to thirty per-

Cross section of a diseased unit showing irregular dark area in heart wood

cent between twenty and twenty-five years—the most productive years of the orchard—and before the trees are thirty years old about fifty percent are diseased. Many trees are dead before they reach thirty years of age due to the activities of the fungus. Badly diseased trees have about one-half their bearing capacity while those having one or two smaller limbs diseased may yield seventy-five or eighty percent of a normal crop. It is safe to assert that at twenty-five years of age the average Ben Davis orchard has lost twenty percent of its potential bearing ability due to blister canker. On the basis of the value of the apple crop in Illinois in 1919 this would mean a loss of about $500,000 for the state that year.

What is Blister Canker?

The terms canker and cancer are often confused. While derived from the same word they now have entirely different meanings. A canker is an external "sore" on the body of the plant. In the case of blister canker, however, the term cancer could well be used since the external "sore" or canker is merely the "breaking out" of an internal disease.

Disease Symptoms

The cankers are found on the large limbs or even the trunks of the trees. They may be from a few inches to several feet in length, and are usually found about old wounds or stubs of limbs. The surface of the canker is quite rough and the bark is checked. If the canker is old the bark may be partly worn away and the "nail heads" may be evident. These consist of many protuberances resembling the thick heads of old-fashion iron nails. If the top of the bark is cut away, black rings about a quarter of an inch in diameter will be observed. The surest method of distinguishing this canker from all others, however, is by examining the bark just beneath the outer layer which may be exposed by cutting thin strips of bark from the surface near the outer edge of the cankered area. This inner bark has a very characteristic "mottled" appearance when the canker is due to

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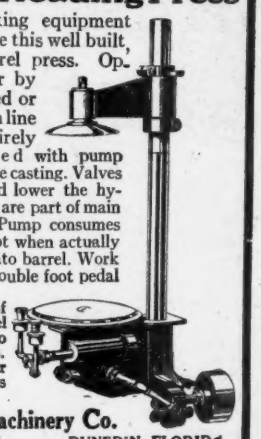

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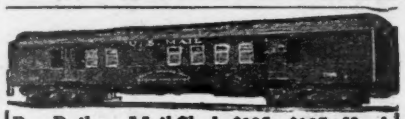

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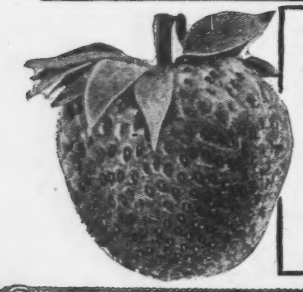

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the blister canker organism. The mottling is produced by islands of light yellow in the normal brown of ordinary dead bark. This mottled bark may be observed when the canker is very small and has not yet produced the "nail heads."

Life History

The "nail heads" are the fruiting bodies of the fungus. In small chambers on the upper surface of these structures spores or seeds are produced which when the weather is moist are shot out into the air. These spores are so small that they are like dust particles and may be carried about the orchard on light currents of air. They may also stick to the feet of birds or insect parts and thus be transported to new fields. There are two types of spores produced—the summer spores, borne in dust like masses on the surface of the nail head when it is first formed, and the ascospores or "winter spores" borne in the chambers beneath the surface of the nail head. The ascospores are much more resistant to drying and other adverse conditions than are the summer spores and thus are of more importance. In fact experimental work indicates that the summer spores rarely cause infection.

Spores germinate only in the presence of moisture as do seeds and like seeds they must fall on fertile ground before they can produce new plants. The ascospores when they alight and germinate on the unbroken surface of the apple limb have no power to penetrate the bark. This is equally true

Condition of Ben Davis trees after several years' attack by Blister Canker

where there is only a small superficial wound. It is only where large wounds are made and where heartwood is exposed that spores find conditions favorable for infection. When an ascospore germinates on the exposed surface of an old wound it sends a germ tube into the wood. This branches, producing a vegetative system which grows deep into the heart wood of the limb. Reaching the center it grows up and down until the limb is diseased several feet in each direction from the original wound. A cut across the diseased limb would show a dark irregular area such as in Figure 4. Up to this time there is no external evidence of the disease and in fact a year or so may elapse after infection before a canker is formed on the surface of the limb. This canker may be formed at the original wound or somewhere else on the limb where the heartwood is near the surface as, for example, where another limb has been removed.

The surface cankers are formed, therefore, in order to give the fungus a chance to produce its spores (seeds) externally. When the canker appears it is evident that the tree has had the disease for some time previous and that the fungus is distributed through at least several feet of the limb on which the canker occurs. Frequently trees showing several cankers have the fungus the entire length of all the limbs of the tree and even down into the roots.

Cankers on limbs cut from the tree continue to produce spores, and the spores thus produced may live for a

Mottled inner bark showing the black rings of the fruiting bodies

year or possibly more. I have succeeded in germinating spores from limbs cut three years previously.

Control

The methods of control of blister canker depend upon the state of the individual orchard to be considered. If the orchard has not been planted the recommendations would be different from those for an established orchard having a prepondrance of Ben Davis and these badly diseased. The following recommendations are made with a view of including all conditions.

If the orchard has not yet been planted eliminate Ben Davis as a possible variety unless you are prepared to take extra precautions in the future.

If the orchard is young and you have Ben Davis planted every precaution should be taken to avoid making large wounds. Train the trees early so that large limbs will not have to be removed. In case limbs three to six years old are removed, paint the wounds twice a year with coal tar or a good paint until the wounds heal.

If the orchard is fifteen or twenty years old and no canker has appeared follow the directions given under (2) but when large limbs are removed paint first with shellac, allow it to dry a few minutes and then cover with coal tar. Repeat this treatment at least once a year. Inspect trees frequently for any signs of blister canker. Be especially careful where limbs have broken off from over-bearing. Cut out and treat these wounds promptly.

Where blister canker is present but has not yet affected more than 10 or 15% of the trees. Make a careful survey of the orchard preferably employing some one who has had considerable experience with this disease. Mark the diseased trees with a broad painted band on the trunks. In all future pruning operations in the orchard the workmen should be instructed to avoid such trees. Limbs completely killed or two-thirds girdled by the canker should be sawed off some distance below the cankered area. Smaller cankers should have all the

A well cleaned wound

dead bark removed and about a half-inch of the living bark about the edge of the cankered area. This can be done most conveniently with a farriers knife and a broad chisel. The wood should then be painted with shellac and coal tar. Before going

(*Continued on page 41*)

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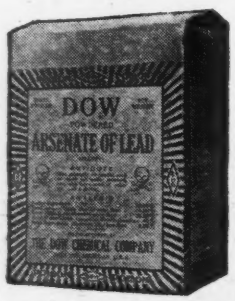

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Insects and Diseases that Attack Citrus Fruits in Southern California

By R. S. Vaile

University of California

ORCHARD costs in the production of oranges and lemons in southern California are probably greater per acre of bearing orchard than are the costs of any other commercially grown fruit in the United States. During the past ten years growers have spent each year an average of $185.00 per acre in the production of oranges and $240.00 in the production of lemons, exclusive of the cost of picking the fruit. Of these amounts nearly 10% has been spent in the control of injurious insects and plant diseases: $11.00 in the case of oranges and $25.00 in the case of lemons.

One of the things which the citrus industry early learned was the absolute necessity of insect and disease control. Probably no other fruit growing section of the country is so completely organized for this purpose. Each county has established an inspection and quarantine service under the direction of a County Commissioner of Horticulture, with power to enforce control measures and to prevent the movement of infested or infected material of any sort from one district to another. Each of these County Commissioners is appointed a State Quarantine Guardian under the State Director of Agriculture, so that he has police power both as a State and as a County official. In some instances similar powers are given to him by important cities.

It is the general policy of the County Commissioners to make a complete orchard inspection every season; each orchard is visited and the owner is advised whether it should be treated for the control of any pest. Usually advice is all that is needed, but occasionally legal abatement notices must be served. The powers of the Commissioners are so drastic and the confidence which the growers place in them is so complete that their suggestions are generally promptly complied with.

Fumigation Expensive

The most expensive single item in the pest control program is fumigation for the control of scale. Many of the cooperative marketing associations have organized departments for this purpose. In a few cases mutual companies have been formed that are not affiliated with the marketing associations. Where one or the other of these cooperative agencies do not exist for the purpose, commercial operators handle the work. There is often keen competition between the commercial operatives and the mutual organizations. Only the largest orchards maintain their own fumigation equipment because of the expense involved. An outfit costs from $3,000.00 to $10,000.00, and as it is used only once on each orchard in any one year, it can handle from 300 to 600 acres.

The pests attacking citrus orchards may be divided into four groups in accordance with the generally adopted method of control; the scales are generally controlled by fumigation with hydrocyanic acid gas, thrips and mites are controlled by spraying with insecticidal sprays, such diseases as withertip and brown rot are sprayed with fungicides, while gummosis and scalybark require hand treatment on individual trees. There is, of course, some over-lapping of groups and occasionally combination control can be effected when two or more groups are infecting the tree at the same time.

The group of insects known as "scales" are generally best controlled by fumigation. Black scale, red scale, purple scale, and citricola or grey scale, comprise the color scheme of this group. Of these, the black scale (sassetia oleae) has the widest distribution, and fumigation is usually timed with this pest in mind. The young black scale commence to hatch in June and are practically all out by the end of August. Fumigation commences in July and continues until the scale are too large to easily kill (sometimes longer, at the expense of the grower). Winter rains in early December often cooperate with size of scale in ending the fumigation season.

Purple scale and red scale can be killed almost as well at one time of year as at another. Either of these require higher dosage of cyanid gas than does the young black scale. With the exception of in a few communities, they are controlled by fumigation at the same time as the black scale, but with 25% higher schedule of gas.

The citricola scale, like the black scale, must be taken when young if it is to be controlled. It hatches a month or six weeks earlier than the black scale, and consequently, when these two pests occur together it is difficult to control both with one operation. Sometimes an early fumigation one year and a late one the next is the program adopted, while sometimes an early spraying and a late fumigation both the same year give the best results. Fortunately, in the district

The process of fumigation. This work all done at night.. The tents are measured and the dosage of liquid gas is pumped under each tent in accordance to the size of the tree

where citricola scale is most abundant the black scale does not occur (Tulare County). In this particular locality the citricola scale is quite generally and fairly satisfactorily controlled by the use of miscible oil sprays. Such sprays have often been tried for the control of the other scales, but have never proven nearly so satisfactory as fumigation.

Natural Enemies

Recently very active attempts have been made to control black scale through the use of natural enemies. The war of "Bug versus Bug" is waged to extermination. Insectaries have been erected by the State and by Counties as well as by private individuals, wherein minute parasites are reared literally by the millions, to be distributed in infested orchards. The outcome is not yet certain. Parasites upon the beneficial parasites are active. Weather conditions are not always favorable. Just as the battle seems almost won the parasites starve to death and the scale multiply again. But worst of all, there is usually some other pest that has to be controlled and that necessitates the expense of fumigation or spraying anyway. This attempt to establish natural enemies represents an especially interesting phase of California's attempt to improve orcharding methods and products and may yet prove very helpful.

Fumigation of full grown trees now costs from $40.00 to $50.00 per acre and in those districts where it must be practiced every year it becomes a large item in the cost of fruit production. Successful biological control would be a great boon.

California now has two instances of success in biological control of pests which at one time threatened to wipe out the citrus industry. During the late 80's the fluted or cottony cushion scale was spreading to all citrus orchards and it seemed resistant to all forms of spray or artificial control. The introduction of a small lady-bird beetle (Vedalia) from Australia saved the day. It is now safe to say that 75% of the orange growers have never seen a cottony cushion scale, and nowhere in the state does it present an economic problem. The second and more recent case is that of the citrus mealy-bug, which was almost as resistant to control measures as was the cottony cushion scale. No one enemy was found which could conquer it alone but finally a combination attack of lady-birds, lacewing flies and internal parasites were found equal to the task. Occasional re-distribution of the beneficial insects is required, but the mealy-bug is no longer looked upon as a serious pest that requires artificial control.

The Red Spider

The second group of pests are of less importance than the scales; that is, they do less damage. Fumigation is not effective against this group. Red spiders, or mites, are widely distributed throughout the citrus area. In the interior districts the heat prevents their rapid multiplication, while near the coast parasites are about as effective in their control as is spraying. There is a middle climatic zone, however, where spraying with lime-sulphur solution or dusting with dry lime and sulphur is a common practice in the late spring. Occasionally two to four sprayings are required.

Citrus thrips occur only in the interior sections. Control methods are not entirely satisfactory with them. Spraying with miscible oil in the winter and with nicotine sulphate (to which lime-sulphur may be added) in the spring is fairly effective, and is the best treatment known. In Tulare County such a spraying program is generally used to control thrips and citricola scale both of which occur there.

Thrips actually scar or scurf the fruit and destroy many of the new leaf buds. Red spider mark the fruit and weaken the mature leaves so that they drop whenever unusually warm weather occurs. The scales materially weaken the entire tree upon which they feed and in addition both the black and the citricola scales secrete a honey dew on which a black smut thrives. This smut interferes with the transpiration of the tree and also necessitates washing the fruit in warm soapy water.

Orange tree partially defoliated by red scale

Plant Diseases

The plant diseases that affect citrus trees in California are not as injurious nor as common as are the insect pests, but they do require eternal vigilance. Two distinct methods of con-

(*Continued on page 44*)

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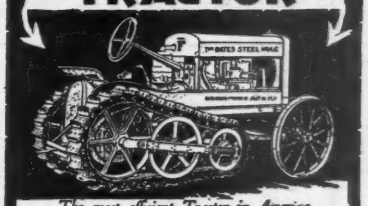

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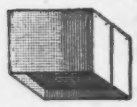

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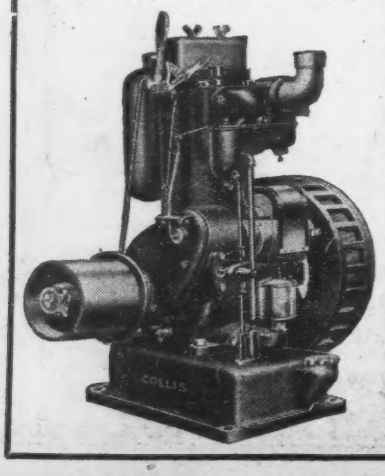

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A Baffling Orchard Pest

By W. L. Howard
University of California

IN the semi-arid region along the Pacific Coast from British Columbia to Lower California, there is a disease among fruit trees that is as baffling and deadly as leprosy in the human family. The disease in question is variously known as oak fungus, root rot and Armillaria. In the Middle West and eastward it is referred to as "rhizomorphic root rot." To American botanists it is Armillaria mellea and in European countries, especially France, it is listed as Agarious melleus.

Armillaria exists naturally in the soil being harbored by oak trees. It is strictly a root disease. The fungus apparently makes slow headway in the deciduous and evergreen oaks of the Western Coast and is rarely the cause of their death. However, after the trees are cut down, the entire root system as well as the stump is invaded by the mycelial threads. The fungus remains alive in the ground as long as any of the roots remain. When the roots have decayed, the fungus must perish. For some reason, not clear, oak fungus is not a serious disease in regions of summer rainfall. In Missouri, for example, it is generally known that apple orchards planted on newly cleared land, formerly populated with oak trees, may be attacked and a considerable percentage of trees lost during the first few years. However, it is customary to say that after the oak stumps have rotted, there will be no further trouble. And experience has shown these beliefs to be correct.

In California, or Oregon on the other hand, the fungus has been known to attack fruit trees twenty-five to thirty years after they were planted. The explanation for this is that pieces of the oak roots remained that long in the soil before the fruit tree roots happened to come into contact with them.

Many of the fruit valleys of the far west were formerly grain growing regions and no irrigation was practiced. Under such conditions, natural decay of the oak roots was very slow. With the coming of fruit trees, the disease quickly became prevalent in spots so that, even though irrigation soon caused the decay of the original oak roots, the fungus had already become established in the new generation of trees. The question is often asked as to how long oak roots remain in a dry soil before rotting. A case has recently come to my notice in Mexico where a small mining enterprise depends upon oak roots dug from the soil by the Indians for its fuel supply. It is a matter of history (the records being kept by a near-by monastery) that the oak forest was cut away some hundred years ago.

Host Plants

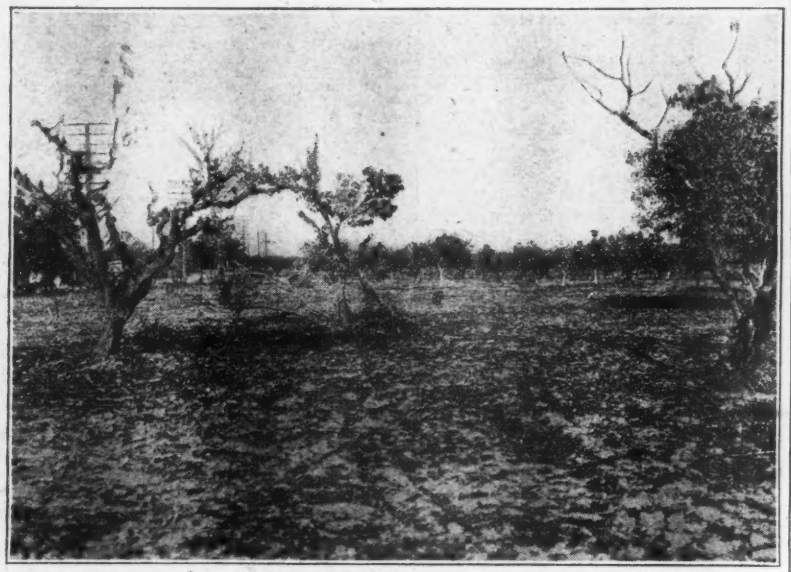
Oak fungus attacks nearly all kinds of woody plants, including trees, shrubs and vines. Even herbaceous perennials are said to be not exempt. In France and Germany great damage is sometimes caused to coniferous forests, especially to spruce trees. Possibly there may be wild tree forms that are exempt; certainly there are many that are not killed outright, as the oaks, but this does not necessarily mean that very many are totally immune. So far as the cultivated fruits are concerned, only three forms are free from the disease—viz., the fig, the walnut on Northern California black walnut stock, and the pear on French pear stock. It is recorded in the literature that both the pear and the walnut have been attacked but no genuine case of either has ever come under my observation, and I have been observing the progress of the disease for the past eight years.

Usually the fruit grower first discovers the presence of the disease in his orchard when the trees begin to die. If the first dead tree with all its

roots is not at once removed, the adjacent trees are pretty certain to die the next year. Thus the trees continue to die from year to year in an ever widening circle, with the center of infection in the middle. Almond and peach seem to be the most susceptible species and plums or prunes on Myrobalan stock the most resistant. Apple is also relatively resistant. Apricot, cherry, walnut on Persian walnut roots and citrus trees are all quite susceptible to the disease. Grapes and even raspberries are readily attacked.

Identification

Identification of the disease is easy.



Large oak fungus spot in an apricot orchard. Old trees in foreground beginning to die

The inner bark of the woody plant affected is covered with great masses of white mycelium which gives to the bast a cottony white color and the whole is velvety to the touch. There are often fan-like designs on the inner bark or even on the wood after the bark is removed. There is also a characteristic mushroom odor to the bark. The mycelial threads not only occupy the bast, but they also penetrate both sap wood and heart wood. It is not uncommon to find roots several inches thick that seem to be filled throughout with the fungus threads.

by the rains before the winter is over. If the latter part of the winter is inclined to be dry, they may harden and remain on the ground for many weeks or months. Usually though, they are destroyed by insect parasites by spring. As the toadstools mature, great masses of spores are ripened and released, but so far as known, the spores are a negligible cause of spreading the disease.

How It Spreads

Oak fungus spreads from root to root and tree to tree in the soil. Although leading a saprophitic existence (that is, living on dead wood, it readily attacks green, living tissue. Usually the roots from a live tree come in contact with the diseased roots of an adjacent dead tree. The former is quickly attacked and the disease spreads up the root rapidly to the crown of the tree, and then passes into other roots. A tree may show signs of the disease when only one root is affected. One large branch at a time may begin to die. This is especially true in old trees. Trees three to four years of age are apt to show no signs of the disease until they suddenly collapse, usually during the early summer. A tree rarely ever dies until the crown is girdled. A characteristic of the disease is the production of numerous rhizomorphs. The fruit grower often calls these "shoe strings." They are masses of mycelial threads commonly 6 to 10 inches long, although they may grow to a yard in length, or even longer. These rhizomorphs may reach out into the soil in all directions, and when they come in contact with a live root attack the latter at once. Remedial measures are few. The *(Continued on page 44)*

Oak fungus spot in a California orchard replanted to figs which are immune to the disease. Such spots may be safely replanted to pears on French stock or to English walnuts on Northern California black walnut stock

This is particularly true of the roots of certain fruit trees. Such roots decay quickly if the soil is kept moist throughout the season. I have known roots of apricot trees 3 to 3½ inches in diameter to completely disintegrate in four years, in a semi-arid region where the orchard was irrigated only twice during the summer. In mild climates, when the winter rains begin, great masses of toadstools are apt to spring up around the base of the diseased trees. The toadstools are quite fragile and are apt to be worn away

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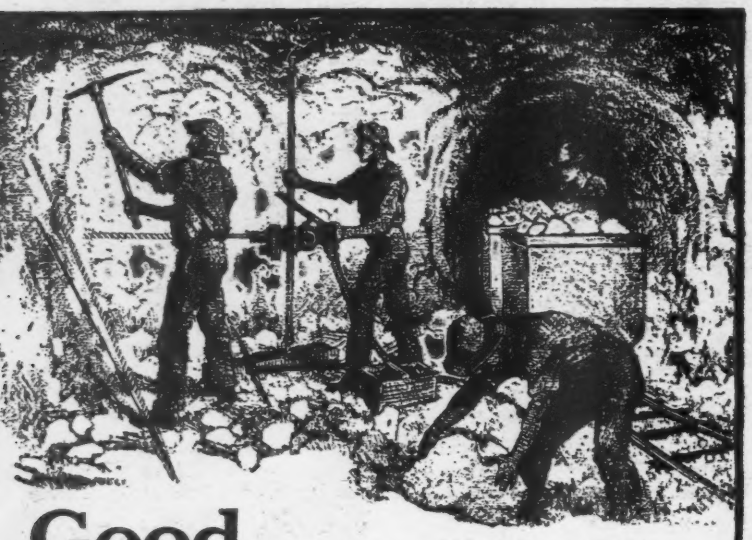

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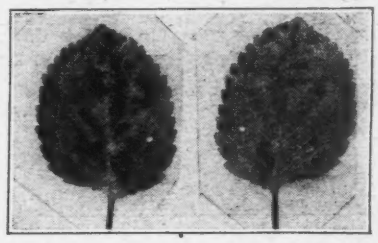
POTASH PAYS

Diseases and Insect Injuries of the Sour Cherry

(*Continued from page 16*)

severe defoliation the fruit becomes insipid and small, while continued defoliation over a period of years devitalizes and often kills the tree.

Experiments for the control of this disease have been conducted over a series of years, by the Department of Plant Pathology. Trials have been made of the effectiveness of various sprays, including liquid lime-sulfur, dry lime-sulfur, "atomic" sulfur, and Bordeaux mixture, as well as tests in relation to the timing and number of applications. During the period of seven years of experimentation Bordeaux mixture has proven more effective in controlling the disease than any of the sulfur sprays. The protection from Bordeaux mixture lasts over a longer period than that from the sulfur preparations. On the other hand, there has been some foliage injury from the use of Bordeaux. It has not, however, seemed sufficient in amount to prohibit the use of this spray. Various strengths of Bordeaux mixture have been tested in these experiments. The 2-2-50 strength has usually given good control, but it has not proven quite as effective as the 3-3-50



Disease spots on the upper and lower surfaces of a cherry leaf

strength. In the experiments at Sturgeon Bay three applications of Bordeaux mixture, 3-3-50, applied as follows have given the most satisfactory control: (1) as soon as the petals have fallen, (2) two weeks later, and (3) immediately after harvest. Three quarters of a pound of arsenate of lead has been added to each 50 gallons of spray for the control of insect pests. Experiments in the control of this disease with dusts have been conducted during the past two seasons. Such materials as copper-lime-arsenate, sulfur-arsenate, and sulfur-dry lime-sulfur-arsenate have not proven satisfactory in comparison with the results obtained through the use of sprays. However, sufficient control has been obtained with these preparations to warrant further experiments along this line.

It should be borne in mind that the development and the control of leaf spot vary with many seasonal and climatic factors, and consequently the Wisconsin program may require modifications to meet the needs of other sections.

Clean cultivation is a valuable factor in controlling cherry leaf spot. Since the disease lives over winter in the old dead leaves on the ground, methods that tend to destroy these leaves before the "winter spores" are discharged are to be recommended. Studies have shown that under Wisconsin conditions the first discharge of spores takes place about the time that the blossom buds begin to break. While it is not practical to practice sanitation with such thoroughness as to make spraying unnecessary, it is possible greatly to strengthen the spray schedule by turning under as many of these old dead leaves as is feasible, prior to the first discharge of spores.

Cherry Aphis

During the last two years the cherry aphis has been a persistent pest. It is extremely difficult to determine the amount of injury caused by these black plant lice, but in extreme cases they may cause complete defoliation of the trees. Although the aphides may be present from early spring through the summer, they usually become most abundant about harvest time. The tree at this time, being under a heavy

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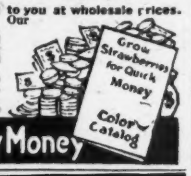

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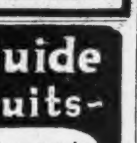

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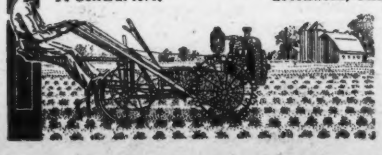
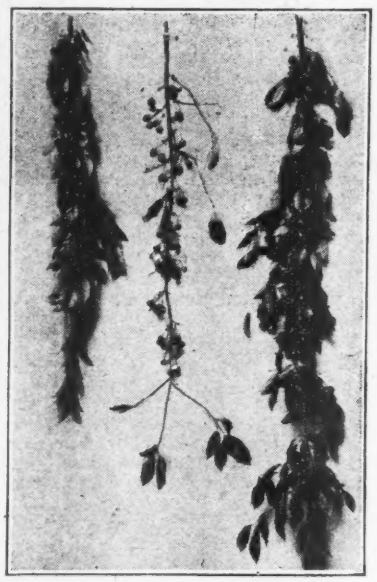


strain in ripening its fruit, is not in a position to withstand the loss of plant juices that are sucked away by the countless small insects. Periods of drought during summer seem to make the trees more liable to defoliation from attacks by these insects.

The life of the cherry aphis is not entirely understood. The eggs usually winter on the twigs, and toward spring hatch into what are known as stem-mothers. These stem-mothers give birth to living young, which in turn give birth to living young, and so on through the summer. Some of the lice develop wings and fly to other trees to start new colonies, and thus the spread goes on. During the fall true sexes appear and eggs are laid.

Since the cherry aphis derives its food by sucking the juices from the tender parts of the plant, it is necessary to use a contact spray. For this purpose nicotine solutions are used, one part of the nicotine solution to 1000 parts of water. About 3 pounds of soap should be added to each 50 gallons of spray to make it spread well. This method of contol is somewhat expensive and is not entirely successful, as each aphis must be hit with the spray in order to be killed. The use of nicotine dust in a small hand duster



The branch in the center was from an unsprayed tree. The leaves were lost early, due to cherry leaf spot, and the fruit did not mature. The other branches were from trees which had received two thorough and timely sprays of Bordeaux mixture before harvest.

when the colonies first appear in the orchard has promise of becoming an effective control measure. In this way one can destroy the individual colonies before the orchard becomes generally infested.

The Cherry Slug

This insect, which also attacks the pear, is seldom found to injure the large commercial orchards. In farm and home plantings, however, extreme injury is not uncommon, leaving the trees entirely defoliated in midsummer. The slug, a brown slimy tadpole-like worm, is one stage in the life history of this insect. The fly-like adults appear during May and lay their eggs in the leaves. In about two weeks the eggs hatch and the slugs, although white at first, soon become covered with a brown sticky slime, which gives them the appearance of small snails. These slugs feed on the upper surface of the leaves, leaving only the veins and the lower surface to turn brown and wither up. There are usually two broods of slugs in a season, the second brood appearing about the first of August.

It is relatively easy to control this insect pest. In the commercial orchards the addition of arsenicals to the regular sprays for the control of leaf spot is sufficient. Three quarters of a pound of lead arsenate in each 50 gallons of spray has been used successfully. When only a few trees are to be treated the slugs may be destroyed by dusting the infested leaves with one or two applications of freshly slaked lime.

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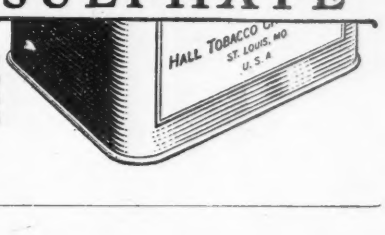
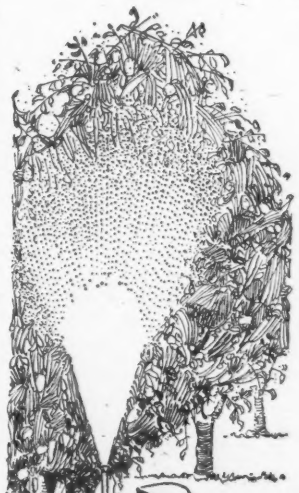


10 lb. tins . .	$13.50
2 lb. tins . .	3.50
½ lb. tins . .	1.25
1 oz. bottles	.35

The Dependable "Bean"

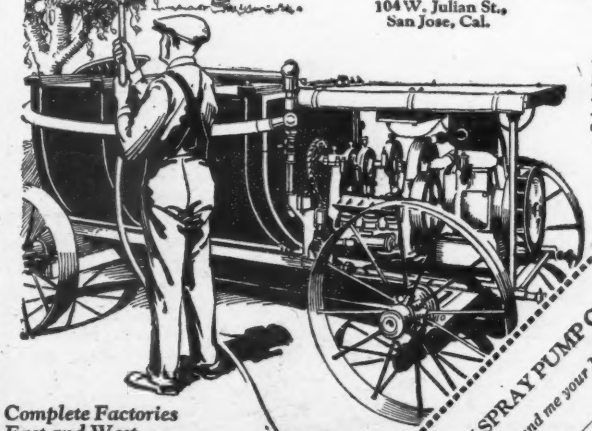


Always ready—always on the job—everywhere it's known as the Dependable Bean. This is especially true in the apple sections and where time-wasting troubles would have particularly serious results. Bean dependability is largely the result of the sturdy Bean Pump, with its porcelain-lined cylinders; absence of stuffing boxes; trouble-less ball valves; long-wearing eccentrics instead of cranks; and the reliable Bean pressure regulator. This year we've furnished more power and reduced the weight on a number of rigs by adding the Bean Engine. Also, we offer a new low-down construction, to avoid tearing off the fruit. Besides, the larger outfits have extra big wheels and wide tires so that they're easy to start and easy to haul. Send the coupon for new catalog which gives all the details.

The Bean Spray Pump Co.

104 W. Julian St., San Jose, Cal.
15 Hosmer St., Lansing, Mich.

We built the first high preesure spray pump 38 years ago



Complete Factories East and West

—and representatives in all fruit growing sections insure good service to Bean owners everywhere.

BEAN SPRAY PUMP CO { 15 Hosmer St., LANSING, MICH. / 104 W. Julian, SAN JOSE, CAL.

Please send me your New Sprayer Catalog

Name_____
Street_____
Town_____ State_____
Kind of fruit grown_____
No. of acres_____ (50-55)

Community Pride

IT is a significant sign of increasing vitality and local pride in rural districts that so many farmers are investing in the securities of their electric light and power companies.

This is a splendid answer to the question: "Why should farmers, who are the best and most regular investors in the whole country, put their money into industries and utilities in distant States, and into industries and utilities whose products may never have a direct bearing on their everyday lives?"

At the time of investing, light and power may not yet have been brought into a farming district. The number and location of customers may not at present justify the expense of constructing and maintaining a line to give such service. But, adequate financial support and fair regulation tend surely towards this accomplishment. The light and power company has a beneficial and progressive effect on the whole district, whether or not the investing farmer has an "electrified" farm.

Electric light and power investments have already appealed to 1,750,000 thrifty Americans as ideal securities. They realize that an industry whose service and rates are regulated by state law is amply protected and safe, and that with a whole nation eager for service it is a steadily growing business.

NATIONAL ELECTRIC LIGHT ASSOCIATION

Spreaders in Poison

(*Continued from page 18*)

the hands of the average laborer the evidence is strongly favorable to spreaders. A spreader does increase the wetting powers and covering ability of the average spray. Analyses of the surface of sprayed fruits at varying intervals of time subsequent to the application of the spray indicate that the spray material containing a spreader persists for a longer period of time. By increasing the adhesiveness of the spray, as the spreader appears to do, it assists to that extent in overcoming faulty timing in application.

Spreaders and Spray Injury

What Effect Does the Use of Spreaders Have on Spray Injury? Experimental evidence is woefully meager on this point. Occasional reports have been made of spray injury where a spreader has been used; the injury occurring as a heavy deposit of spray and russeting in the form of a ring about the calyx lobe. The evidence regarding the actual cause of the injury has by no means been convincing. Usually aphis honey dew in excessive quantities is present to complicate the issue.

Often, through the spreader affording a more even covering of spray, the spray burn which sometimes occurs on exposed fruits is lessened or lacking. A type of russeting due to sprays, formerly reported as common on yellow varieties of apples in one fruit section of Oregon, has disappeared from these orchards since the advent of the use of spreaders there. The value of spreaders in certain combination sprays in decreasing the chances of spray injury and in increasing the chances for maximum efficiency of each spray material is evident. This point is best discussed under the succeeding paragraph.

Spreader in Combinations

What is the Effect of a Spreader in Combination Sprays? One of our most common spray combinations in the Northwest is lead arsenate and lime-sulphur. Where these materials are used together a chemical reaction takes place which is slightly detrimental to both materials and gives rise to the formation of a heavy, black, objectionable sludge. The violence or extent of this chemical reaction will vary with the acidity of the lead, the concentration of the combined solutions, etc. One of the most readily observed and by no means the least valuable effects obtained from the use of the casein spreader is in its addition to this combination spray as evidenced by the marked retardation in the reaction of the two materials. The sludge develops slowly, the materials are changed but slightly, in fact the beneficial effects in retarded reaction alone warrants favorable consideration of the use of a spreader here.

Where summer infestations of orchard plant lice required the application of nicotine, the logical practice is to add nicotine sulphate to the summer cover spray of lead arsenate as regularly applied for worm control. Tests carried out in Idaho and verified in our experiments at the Oregon Station indicate that the addition of the casein spreader to this combination spray increases the efficiency in aphis control to a very marked degree.

While outside our immediate discussion of spreaders in the poison sprays, tests and demonstrations by commercial agencies indicate that the casein spreader in combination sprays of nicotine sulphate and lime-sulphur are likewise valuable in retarding undesirable reactions and increasing the efficiency of the application.

As to the value of casein spreader in Bordeaux sprays or combinations, emphasizing the fact that we have carried forward no tests with this material, there are sufficient, authentic reports of adverse results as to warrant the admonition to proceed with caution. It is probably advisable, for the present, to reduce the amount of spreader

(*Continued on page 33*)

SPRAY GET BETTER FRUIT AND TIP-TOP PRICES

There is no market for knotty, gnarled fruit and wormy apples. Spray with the right material at the right time and give nature a chance to grow her finest. You will find just the spraying appliance you need in our famous line of

OSPRAYMO

High Power Sprayers

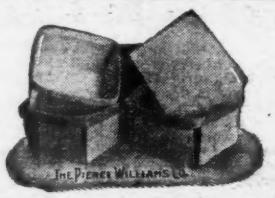
An Ospraymo Sprayer means a high-power sprayer, and high power is most important. You are sure to make your spraying job effective.

Gasoline Engine Orchard Sprayer

Above is a popular style of power sprayer for general orchard spraying. Investigate our mounted traction Red Jacket and Yellow Jacket Sprayers for beans, potatoes and vegetables. Also Barrel, Bucket, Knapsack and Hand Sprayers.

Send today for our latest catalog. Don't buy any sprayer until it comes. We have local dealers at many points, but write direct for catalog to the address below.

FIELD FORCE PUMP COMPANY
Dept. B, Elmira, N. Y.
40 Years at Sprayer Building



Baskets for Apples, Peaches, Plums, Grapes, Tomatoes, Cucumbers, Beans, etc. Boxes and Crates for Berries, Cucumbers, Celery, Cauliflower, and vegetables of all kinds.
PLANT BOXES
Catalog mailed on request
The Pierce-Williams Co. South Haven, Mich. Jonesboro, Ark.

U.S. RECORD IN 129 DAYS 1 ACRE OF CHAMPION EVERBEARING STRAWBERRIES $2,059.20

Without irrigation. Set and harvest same year. A commercial Everbearing, will bear a sure crop for 5 months after set 60 days. Some report making $150 from 1000 plants. Largest in yield, large in size, most delicious and sweetest of all. Home of the true Strain Champion plants. Write today for FREE illustrated Booklet.

ORIGINATOR EDW. L. LUBKE, R1, New Buffalo, Mich.

PARKER'S HAIR BALSAM
Removes Dandruff—Stops Hair Falling
Restores Color and Beauty to Gray and Faded Hair
60c. and $1.00 at druggists.
Hiscox Chem. Works, Patchogue, N. Y.

REX DRY LIME SULPHUR
Produced under our own patents.
Best quality at lowest price.
REX OIL EMULSION
At one-fourth the cost of other oil sprays.
Write us for full information and prices on quantities wanted.
THE TOLEDO REX SPRAY CO., Toledo, Ohio
Makers of the famous *NuRexform* (Dry Lead Arsenate)

Engine Sale 1923 Model OTTAWA
Write for Special Low Prices and FREE Engine Book!
OTTAWA MFG. CO.
1174H King Street, Ottawa, Kans.
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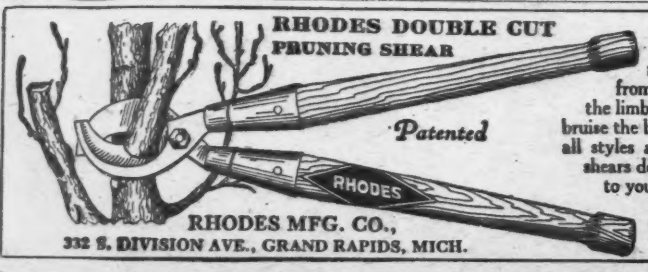
30 VARIETIES STRAWBERRY PLANTS—Dunlap $3.50, 1000. Premier, early, $6.00. Gibson Aroma, etc., $4.50. Cramptonlatest $7.00. New Champion Everbearing $15.00. Progressive Everbearing $9.50. Black Raspberries $14.00. 100 Champion Everbearing, post paid, $2.00. 100 Progressive, post paid, $1.25. 2-year Concord Grapes $8.00, 100. Gooseberries, Currants, 5, $1.00. 12 Grapes, $1.00. Catalog.
KIGER'S NURSERY - SAWYER, MICHIGAN

RHODES DOUBLE CUT PRUNING SHEAR



Patented

THE only pruner made that cuts from both sides of the limb and does not bruise the bark. Made in all styles and sizes. All shears delivered free to your door. Write for circular and prices.

RHODES MFG. CO.,
332 S. DIVISION AVE., GRAND RAPIDS, MICH.

Are you interested

in knowing more about the work done and results obtained by the proper use of commercial fertilizers? Experiment Stations and farmers everywhere have for years been studying the question.

Twenty-five years of this work have given abundant proof that large profit may be obtained from the proper use of nitrogen.

Nitrate of Soda

furnishes this nitrogen in the cheapest and most available form which gives immediate and lasting results.

A new series of Bulletins with valuable information on the growing of all crops is now being issued. They will be published at intervals over a period of a year or more and should be in every farm library. A post card with your address asking for my *Bulletin Service* will bring them to you *Free of Cost.*

Dr. William S. Myers, Director
Chilean Nitrate Committee
25 Madison Avenue New York

Running Water Under Pressure for Every Farm

Hoosier Water Service—on your farm—gives you every advantage of city water service. At the turn of a faucet you can have water in abundance for drinking or kitchen purposes; for laundry, bath and indoor toilet; for lawn, garden, barns and fire protection; for dairy use or stock watering, at no greater cost for the conveniences than you now pay, with drudgery of pumping and carrying water by hand.

The Hoosier Water Service fits your water facilities—gets its supply from a well of any depth; from lake, spring, creek or cistern. Uses any power—electric, gas engine, windmill or hand. Costs little to install and practically nothing to operate.

Write For This FREE Book

How To Have Running Water

"How to have Running Water" a hand book of complete facts, from which you can figure the installation that best meets your requirements. No matter how you now get your water—get this book. It's FREE and there is no obligation. Send your name and address today.

Flint & Walling Mfg. Co.
Dept. S Kendallville, Ind.

HOOSIER Water Service

Large Income from **CHAMPION EVERBEARING STRAWBERRY** The originator of this new everbearing strawberry broke the record for large incomes. It produces much larger crops than Progressives. Some report a yield twice as large. Our stock direct from introducer and we guarantee them to be genuine Champion plants. A limit of 500 plants. Place your order now. 25 plants $1.00; 50, $1.75; 100, $3.00; 250, $6.00; 500, $10.00 if ordered from this advertisement. **Our FREE Berry Book tells more about our Fruit Plants.**

St. Joseph Nursery, 1203 Main St., St. Joseph, Mich.

STRAWBERRY PLANTS

$3.50 PER THOUSAND, AND UP. Our strong, healthy, tremendous bearing plants guarantee big crops of luscious berries Best varieties for all kinds of soils. Many new varieties such as **Eaton, Bun Special, Premier, Marvel** and **Cooper.** The worlds' greatest new Everbearing Strawberry CHAMPION. Full line of Raspberries, Blackberries and Asparagus. **Greatly Reduced Prices.** Our customers are making up to $1,200 per acre from small fruits. Large stock of good **Grape Plants** at $35.00 per thous.

Beautiful new color catalog free. *Write To-day*
BRIDGMAN NURSERY CO., Box 2, Bridgman, Mich.

GOOD SEEDS

Grown From Select Stock —None Better—53 years selling good seeds to satisfied customers. Prices below all others. Extra lot free in all orders I fill. **Big free catalogue** has over 700 pictures of vegetables and flowers. Send your and neighbors' addresses.

R. H. SHUMWAY, Rockford, Ill.

PEACH TREES

THE RIGHT SIZE		THE RIGHT PRICE	
Size		Per 100	Per 1,000
4 to 5 ft.		$25	$200
3 to 4 ft.		20	150
2 to 3 ft.		15	125
1½ to 2 ft.		12	100
1 to 1½ ft.		10	85

Ask for Our List of Other Fruits

Chattanooga Nurseries, Box C, Chattanooga, Tenn.

STRAWBERRY PLANTS

Strong, Healthy Heavy Rooted **New Prices Lowest of All**

Big 160-page Garden Guide FREE. Everything in Plants Fruits, Seeds, etc. Condon Guarantees You Satisfaction.
CONDON BROS., SEEDSMEN Box 18 ROCKFORD, ILL.

A Flower Garden for 10 Cents

A choice selection of *FIVE* Packets of **Jim Young's Full-O-Pep Flower Seeds**, Mignonette, Pansy, Alyssum, Phlox and Poppy. A copy of Jim Young's new Flower Seed and Nursery Book free with each order, stamps or coin.

Jim Young's Seed and Plant Farms
65 La Salle St., Aurora, Illinois

Free for Testing

A pair of mated **Everbearing Strawberry Plants FREE** if you will report your success with them. Will bear loads of big red berries the same season plants are set. We have been breeding Everbearing Strawberries for 13 years and have counted 480 berries, buds and blossoms on a single plant in September. A postal will bring the plants and 10 kernels **Burbank's new GOLDEN POP CORN** and 10 seeds of the wonderful earliest of all **BURBANK TOMATO.** Also our catalogue of Hardy **"BLIZZARD BELT"** products with seed for a Silkleaf Poppy garden Grown in for good measure. Send 10 cents for mailing and expense or not, as you please. Write today and get acquainted with our Hardy **"Blizzard Belt"** Fruits, Seeds, Potted Bulbs, Everlasting Flowers, etc. **THE GARDNER NURSERY COMPANY, Nurserymen and Seedsmen, Box 317, Osage, Iowa.**

One Dozen genuine Progressive Everbearing Strawberry Plants mailed at proper planting time for 47c or four dozen for 97c if ordered NOW direct from this advertisement.

Prominent Enemies

(*Continued from page 21*)

ance. In severe cases the skin of the fruit becomes cracked and brown rot follows as a sequence. Very early ripening varieties such as Mayflower and Greensboro mature before the disease gets fairly started but late sorts such as Smock, Salway, Bilyeu and Heath are quite susceptible.

Control of Brown Rot and Scab

For most localities and orchard conditions the first spray for the control of these diseases should be applied just as the calyces"shucks" are beginning to be shed from the fruits. In other words, it is combined with the first spray for curculio. The second application should follow in about two weeks where these diseases are serious. In fact, this is the critical spray with varieties ripening at about the season of Carman. The fruits will be ⅝ to ¾ of an inch in diameter and unless this spray is applied timely and thoroughly the fruit may show some scab at maturity regardless of what other spraying was done. The scab appears a few days later upon varieties of the season of Elberta and the second spray for them may follow the second for Carman a few days without danger of serious infection. Additional sprays should follow about 3 weeks apart in humid regions for varieties ripening later than Carman. It is not desirable to spray within less than two weeks of the ripening time of each variety as a general rule otherwise the fruit may have a sprayed or whitewashed appearance. No rule of thumb spray schedule is practical. In rainy seasons it becomes necessary to spray more frequently than in dry. A spray schedule is therefore simply a general guide.

Some varieties of peaches such as Triumph and Champion are very susceptible to rot and are likely to decay considerably in wet, rainy seasons regardless of frequent spraying. They should be discarded for better sorts.

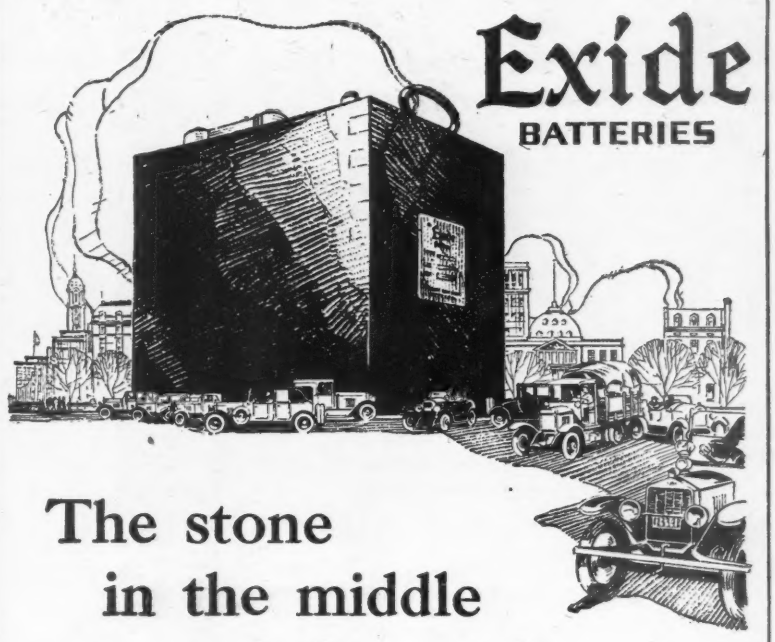
What Fungicides to Use

Self-boiled lime sulfur has been the standard fungicide recommended for the summer spraying of the peach since about 1910. It is troublesome to prepare however, contains a heavy sediment and is not popular with the growers.

Sulfur dusts have been rather widely tested in recent years and have generally given satisfactory control of both scab and brown rot. Serious defoliation has resulted from the use of sulfur dusts in some instances because of too small a proportion of lime in the mixture. A common formula has been a so-called 80-10-10 or 80 lbs. sulfur, 10 lbs. hydrated lime and 10 lbs. powdered arsenate of lead. The New Jersey station does not think that less than 20 lbs. of lime is safe when weather conditions favor burning by the combination of lead and sulfur. Farley of the above mentioned station now recommends a so-called Dry Mix Sulfur Lime as a substitute for self-boiled lime sulfur as a result of experiments in 1922. The formula is 8 lbs. finely ground sulfur, 4 lbs. hydrated lime and 8 ounces of calcium caseinate in 50 gallons of water. The three ingredients are mixed together dry and may then be diluted. The caseinate spreader permits the wetting of the sulfur. This new spray appears to be convenient, relatively cheap and effective.

Leaf Curl

This is a fungus disease which causes a curling and distorting of the leaves in early spring. It is most serious in districts and orchards where the temperature is variable at the season when growth begins. The affected leaves finally turn brown and fall from the trees. New leaves take their place but the trees are weakened, and in serious attacks the trees may drop most of the fruit which has set. The disease is very easily controlled if a good fungicide is thoroughly applied before the leaf buds burst their bud scales in late winter or early spring. Bordeaux Mixture or winter strength



The stone in the middle of the road

Do you see the road ahead sharply when you are driving at night? Or do you first notice obstructions when you run over them?

Comfort in night driving, not to speak of safety, depends on the lasting power of your battery. This, in turn, is not a matter of luck, but rests on your choice of battery in the first place.

You have a right to demand three things of a battery, the three things that millions of motorists have learned they can be sure of in Exide Batteries:

1. Plenty of power 2. Rugged dependability 3. Long life

An Exide means not only comfort, safety, care-free satisfaction and the minimum of repair bills, but it means actual economy, because the Exide lasts so much longer than other batteries.

Promise yourself an Exide when you have to replace your present battery. You can get one the right size for your car at the nearest Exide Service Station.

The Electric Storage Battery Co.
Philadelphia

Oldest and largest manufacturers in the world of storage batteries for every purpose

Exide BATTERIES SERVICE STATION

Wherever you see this sign you can get the right size Exide Battery for your car, or skilful repair work on the farm power and light plant battery and on any make of automobile battery. If the nearest Exide Service Station is not in your telephone book, please write us for the address.

For farm power and light

A great majority of all farm power and light plants have Exide Batteries. Make sure that yours is a long-life Exide.

The long-life battery for your car

Orchard Heating is Orchard Insurance

It saves fruit, protects trees, and *insures your profits*

Last winter's freeze convinced California growers that Orchard Heating Pays. Heated orchards gave full crops; others lost most of their fruit, some even the trees. Heated orchards saved their crops and returned the entire cost of heating ten times over.

Orchard heating is the only form of orchard insurance. Better than that, it is the only effective form of orchard protection.

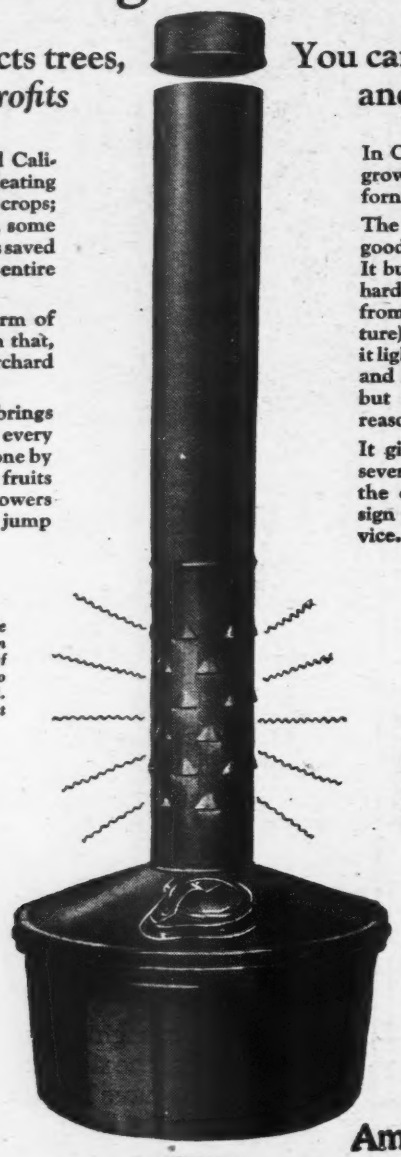
Fruit gathered in a freeze year brings an extra good price. Almost every season there is great damage done by frost—more even to deciduous fruits than to oranges and lemons. Growers that equip with heaters get the jump on the rest.

You can "heat all out doors" and make money at it

In California they *know*. Other fruit growing districts can profit by California's hard gained experience.

The Scheu Heater has already made good on the Coast and in Florida. It burns oil, holding enough to burn hard all night; it radiates the heat from the hot stack (as shown in picture) where it will do the most good; it lights easily, due to special deflector and lighting cup. It is low in price, but will last 10 to 15 years with reasonable care.

It gives complete protection in the severest weather. Others have done the experimenting—here is the design that has made good in hard service. Write for full details.



Showing how the heat radiates from the louvre section of the stack, about two feet off the ground. This is the hottest part.

In this part of the stack combustion takes place. The upper stack is to increase the draft and give smokeless burning.

The Fruit Growers Supply Company, Los Angeles, representing 10,000 growers of Sunkist oranges and lemons, has approved the SCHEU Smokeless Orchard Heater, made by the American Can Company. 7 and 9 gallon sizes.

In addition to the Scheu type, we make Canco Heaters in 3, 5 and 7 gallon capacity; 10 quart Canco smudge pots, and 6 quart Canco torches. Write for information—to Toledo direct or the agent nearest you. Our agents make frequent demonstrations.

Orchard Heater Agents:

Pacific Coast States
W. C. SCHEU
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West Tampa, Florida

American Can Company
ORCHARD HEATER DEPT.
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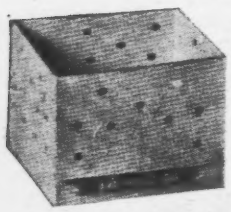
TRADE CANCO MARK

Ventilated Berry Boxes

Folding and Set Up in Crates Complete

Plain or Old Style



Set up in Crates Complete, also sides with long bottom for growers who make their own boxes. K-D wirebound crates requiring one nail to set up complete.

Write for booklet entitled

"More Money for Your Fruit"

Opgenorth Ventilated Folding Berry Box (Set Up)

UNITED FRUIT PACKAGE CO.
Box 577-1 Shawano, Wis.

Strawberry Plants

Burmeister & Hartung's beautiful new illustrated catalog is free and now ready for you. This valuable text-book shows how to make big money growing our B. & H. northern grown highest quality Everbearing and standard varieties. Plants grown on new land with vigorous white root systems. Also raspberry plants and grape vines. Prices right. We guarantee our plants true to name and reach you in good condition or refund your money. Write now for our catalog and read how to grow, pick, pack and market strawberries successfully.

Address **B. & H. NURSERIES**
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KITSELMAN FENCE

You, Too, Can Save

"I saved just 50 per cent and am more than pleased with the fence," declares E. J. Sheppard, Ankeny, Iowa.

"I saved $95.18 on the 270 rods of all No. 9 Fence. It's the best fence in my vicinity," says John W. Kemp, Alton, Indiana.

Direct from Factory to Farm

You, too, can save money. Our thousands upon thousands of regular customers are cutting their fence costs to the very bone by buying direct from us at **Lowest Factory Prices.** The quality of Kitselman Fence was never higher; prices are 'way down. Buy now and keep the difference in your own pocket.

We Pay the Freight

Let us send you our Free 100-page Catalog of Farm, Poultry and Lawn Fence, Gates, Posts, and Barbed Wire. Write today for this money-saving book.

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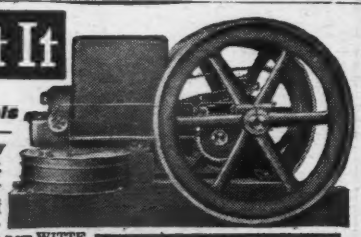
America's Oldest Fence Manufacturers.

Read About It

New Kind of Power—Use Low Grade Fuels

An engine a boy can understand—Fewer parts—New design—Every part simplified—Mechanically correct. Built of the very best materials. Power increased or decreased at will. Positive exhaust. Automatic air valve. Starts without cranking. BOSCH Magneto or COLUMBIA Battery.



WITTE Brings Out NEW IMPROVED THROTTLING GOVERNOR ENGINE

Years Ahead—The new WITTE brings together a score of practical improvements that will stand for years to come—The engine every man will buy and use because of its simplicity and easier operation on either Kerosene, Gasoline, Distillate or Gas. In all sizes and styles, 2 to 25 H-P. — Stationary, Portable or Log Saw. Write for the Big New Catalog.

Big New Catalog FREE

2 H-P. Pulls 2¼ at normal speed, or 3 H-P. at maximum.

$45.00 F. O. B. Kansas City. Columbia Battery. F.O.B. Pittsburgh..$48.50 F.O.B. San Francisco 57.00

OTHER SIZES AND STYLES AT PROPORTIONATE PRICES.

WITTE ENGINE WORKS
2145 Oakland Ave., Kansas City, Mo. 2145 Empire Bldg., Pittsburgh, Pa.
121 Fremont Street, San Francisco, Cal.

lime sulfur is effective. If the buds swell and the leaf tips are exposed before the protective spray is applied the disease is likely to enter the leaves and a serious infestation occur in spite of the spraying. In fact, a spray applied late is little or no better than no spraying as far as the control of leaf curl is concerned.

Peach Yellows

Peach yellows is the old "bugbear" of the eastern peach growers and it is still with them and its exact cause still unknown. Little peach and rosette may be distinct diseases but recent observations lend strength to the theory that they are different forms of the same malady. Climate appears to be a factor in their prevalence. Rosette does not occur north of the Carolinas and yellows and little peach have not been reported south of that region.

The character of the trouble in the case of yellows and little peach is an interference with the normal translocation of elaborated plant food within the plant. In other words, the starch formed in the leaves during the day is not normally changed and transferred during the night as in normal trees.

Some facts which appear to be established in connection with this disease or diseases are as follows:

1. No variety appears more resistant than another.
2. Yellows and little peach are transmitted by budding or the insertion of a piece of diseased bark which unites with the healthy stock.
3. The disease is not transmitted by pollen.
4. The disease is probably not transmitted by pits or seeds from diseased trees.
5. Fertilization with different forms and amounts of plant food has no apparent influence.
6. Trees may be infected several years before the advanced symptoms appear.
7. In some localities outbreaks occur quite regularly every 10-12 years.
8. Where diseased trees are not removed an increasing number become diseased.
9. Trees replanted in the place of diseased trees are no more susceptible than any other trees.

Diseased trees should be cut down and destroyed as soon as they are detected. They are unprofitable in any case and are a menace to the other trees.

Bacterial Leaf Spot

This disease attacks both the leaves and the fruit. It cause a "shot-hole" effect upon the leaves. Irregular brown areas appear particularly along the midribs. These areas dry and fall out leaving holes in the leaves which in turn fall as soon as many spots develop. In serious attacks the ground is covered with green and yellow green leaves in midsummer. The disease can be found in most eastern districts annually but is seldom serious only a small percentage of the leaves being affected. It is often confused with spray burning but the two may be readily distinguished by a little study. The disease appears first upon the green fruit as brownish dots. As the fruits expand these dots develop into pitted spots and irregular cracks through the skin of the fruit making it almost unsalable at times.

The J. H. Hale is particularly susceptible to injury by bacterial spot especially upon very light, dry soils. Hiley appears somewhat more resistant to it than others. The injury is seldom serious where the trees are kept growing properly and receive adequate amounts of plant food and tillage.

Powdery Mildew and Root Gall

Mildew is most likely to attack the foliage and fruit of glandless varieties and none are prominent commercially. The disease is favored in regions of marked temperature fluctuations including the Great Lakes district and the far west and northwest. In some seasons the disease appears along the Atlantic coast but the blemishes upon the fruits are in the nature of almost inconspicuous reddened areas which do not affect the market value. The

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regular summer spray schedule should prevent serious damage in most regions.

Root gall occasionally causes some damage to peaches especially if the trees are set upon the site of an old red raspberry plantation and do not receive good culture and tillage. It is always advisable to avoid following raspberries with peaches if the former was diseased. In general if peach trees free from galls are planted they will not contract the disease to a serious extent.

Relation of Good Culture to Insect and Disease Control

The thorough tillage, pruning and general care of orchards is of great assistance in pest control. An orchard full of weeds, grass and trash of various sorts offers favorable conditions for the harboring and propagation of some enemies. Dead and dying branches attract bark beetles and are a handicap and menace in other ways. Weak, neglected trees are unable to outgrow injuries and are also more susceptible to successful attack by their enemies. Keep the trees pruned, tilled and fertilized as well as sprayed.

Spreaders

(*Continued from page 30*)

by one-half, from that used in the poison solution and to dissolve the spreader separately in water, before adding to the spray solution.

Spreaders and Blotchy Spray

Does the Use of a Spreader Minimize the Undesirable Blotchy Spray Covering on Mature Fruits? Where spreaders are properly employed there is little disagreement on this point. The smooth, even, inconspicuous covering of the spray on the maturing fruits permits of a more even coloring of the red varieties of apples, a factor of decided importance under our careful grading rules of the Northwest, and of sufficient merit that many growers otherwise skeptical as to the value of spreaders recognize their worth and advocate the addition of a spreader in the last cover spray.

Summary

In summarizing our present knowledge of the status of spreaders in the poison spray solution, therefore, we may state that the reaction generally among investigators and among the growers who have given spreaders a fair trial is very favorable. This past season has witnessed a decided increase in the tests and commercial use of spreaders in the East and Middle West. The majority of the reports indicate that spreaders have made a steady gain in favor. As far as the increased efficiency obtained by the use of a spreader in the poison spray solution is concerned there is room for reasonable doubt and probably in the hands of a careful manipulator there is little to recommend the use of a spreader. They do, however, assist in overcoming the results of poorly applied or ill-timed spray applications.

Spreaders are of particular merit in combination sprays because of their action in retarding the chemical reaction between the spray materials and thus permitting each substance to act to more nearly its maximum efficiency. They are likewise of merit in the late cover sprays where the heavy, blotchy spray covering otherwise obtained and so decidedly undesirable may be minimized or eradicated entirely. For the majority of growers we believe that it is advisable to use the commercial spreaders. They are carefully prepared from selected materials and in general will give more satisfaction than carelessly prepared home-mixed materials.

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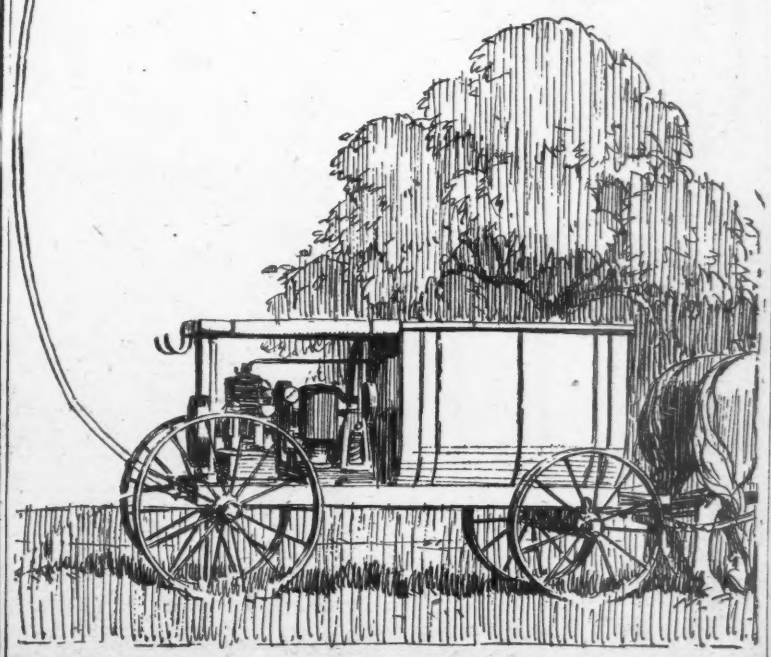

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Orchard Problems and their Solution

by Paul C. Stark
Associate Editor

Varieties for Hudson Valley

MY FARM is located in what is known as the Hudson Valley Section and many of my neighbors grow fruit extensively and have made excellent profits. I have a small home orchard but I am contemplating planting 25 acres to apple trees. Would you recommend early or late apples and what varieties? —C. T. S., New York.

THE Hudson River Valley Section has made rapid strides in recent years and the high grade fruit and progressive ideas of the growers have been well rewarded. It is well adapted to fruit growing and many of the growers have had excellent results from growing the higher quality varieties, such as McIntosh and Delicious, and selling them at high prices. New York is very close at hand and for this reason, I would recommend a moderate planting of early apples such as Duchess and Wealthy, but most of the crop should be late apples, such as McIntosh, Delicious, etc. The old-time varieties like Baldwin and Rhode Island have serious faults and have been overplanted in many sections. I would not advise you to plant them. The public wants better quality and more attractive varieties.

Combination Cultivation and Mulch

MY ORCHARD which is now five years old has been cultivated each year but the soil is beginning to wash badly. Aside from this, I like cultivation, particularly in a young orchard. Can you give me any suggestions that will solve my problem?—G. J. D., Kentucky.

MANY growers who have young orchards on sloping ground have the same problem as yours. In my own orchard several of the fields wash badly if given continuous cultivation. Mr. Merrill, horticulturist of the Southern Railroad, gave me some excellent advice on this subject several years ago and I will pass it on to you. He advises in conditions such as yours to grow crops like clovers, vetch, rye, etc., in one middle between rows and in the next middle to follow a system of cultivation. On the following year, the rows can be reversed. This prevents washing and gives the tree the benefit of cultivation. The crops can be mowed and let lie or raked around the trees.

Proper Site for Orchards

I HAVE two pieces of land which I am considering for planting to orchards. One is a south slope and well drained loam soil. The other piece is a north slope but part of it is wet and poorly drained. Which would you advise for orchard?—T. B. C., Illinois.

THE question of slope was formerly considered much more important than at the present time. Trees on a northern slope will bloom slightly later and will be less affected by droughts in the summer than the southern or southwestern slopes. However, in the average commercial orchard, several various slopes will occur and it has been my observation that in the well cared for orchard, the slope matters very little. In your case, I would certainly advise the southwestern slope with the good drained land in preference to the poorly drained wet land with the northern exposure.

Nitrate on Young Trees

MY YOUNG orchard is 4 years old and has made only fair growth. It is too steep to cultivate but I have tried to hoe around each tree but there are so many trees that I don't get to hoe very often. Should I fertilize? What formula do you advise?—W. S. N., Ohio.

FOR your young orchard, nitrogen is the most important element to increase the vigor of the trees. You can use either Nitrate of Soda or Sulphate of Ammonia, both of which are concentrated nitrogenous fertilizers. For your 4 year old trees, 1½ or 2 lbs. per tree will be sufficient. Apply on the surface of the ground, scattered as far out as the limbs extend as the roots of the tree usually extend out as far as the limbs of the tree. Just after the trees start to leaf out in the spring is the best time to apply the fertilizer.

Renovating Old Orchards

I WANT to go into the orchard business but am undecided whether to buy an old orchard or to get a good piece of land and plant out an entirely new orchard. I have in mind one old 40-acre orchard, about 26 years old, mostly Ben Davis but about a fourth of the trees have died from neglect as the owner has not pruned or sprayed regularly. Can this ochard be replanted and renovated without too much expense?—S. A. G. Ark.

AN orchard can often be brought back into profitable bearing if it is of the right varieties and if it has not been neglected too much. However, the orchard you mention is mostly of Ben Davis and that variety, besides being of poor quality, is short lived and is one of the worst to canker. If you already owned the orchard I would suggest that you try to bring it back to profitable bearing—but I would never advise you to buy it because it will be an uphill fight. It would be much more satisfactory to plant a young orchard, selecting those varieties you want and which bring the highest profits. By using a system of intercropping with corn, clover, cowpeas, soybeans, etc., you can grow enough crops to get an income off the land while the trees are growing. Handled right you can also hog down these crops with young hogs, taking care not to put too many in a small area. Arkansas has splendid opportunities for orcharding. I have charge of one young orchard in that state and have had occasion to investigate quite carefully their orchard conditions which are very favorable.

Fertilizing Young Trees

Please inform me under head of Orchard Problems what kind of fertilizer to use in setting out apple and peach trees? The land is a thin clay and needs some kind application.

I have not got the manure to scatter broadcast on this place. I am setting 5 acres to peach and apple trees this fall. What about wood ashes burned out of hard wood in the month of October and put around the trees middle of November. Will this injure the trees, or be of any benefit? —S. H. C., Kentucky.

A LARGE per cent of land is lacking in available nitrogen. This can be added to the soil by scattering barnyard manure broadcast or by growing cover-crops and turning under.

Many orchardists find that their land is lacking in nitrogen after the trees have been planted and it is often necessary to apply nitrate of soda or sulphate ammonia to the trees in order to stimulate them. Either of these should be applied in the spring just as growth starts.

The extra growth from the trees which have had an application of available nitrogen in the above forms is very marked—on either apple or peach trees. Manure is best for trees just planted out. After they have grown a year, a small application (⅛ to ½ lb.) of nitrate of soda or sulphate of ammonia gives splendid results.

Wood ashes contain potash (also lime) which is necessary plant food but more important on bearing trees than on young trees. Most soils have enough potash for young trees, but ashes are good and can do no harm to the trees.

All Patterns 10c, stamps or coin (coin preferred).

1200. Smart Overblouse.
There are so many of these gayly patterned overblouses worn this season that every woman who wishes to be well-dressed should have at least two.
The pattern is cut in sizes 36, 38, 40, and 42 inches bust measure. Size 36 requires 1¼ yards of 36-inch material with ⅝ yard binding.

9979. Thinning Lines for the Stout Woman.
The woman who is a bit heavy will find the lines of this smart model very becoming. The long, narrow collar, the front panel and well-fitted sleeves will tend to take away that appearance of fleshiness.
The pattern is cut in sizes 42, 44, 46, 48, 50 and 52 inches bust measure. Size 46 requires 4¾ yards of 36-inch material with ⅝ yard of 36-inch contrasting and 5 yards binding.

9875. Neat Morning or House Dress.
This house dress style is made to slip over the head with the short kimono sleeve and side body in one-piece. The becoming bib section terminates in sash ends that tie at the back.
The pattern is cut in sizes 36, 40, and 44 inches bust measure. Size 36 requires 3¾ yards of 36-inch material with 3¼ yards of edging.

1303. Slenderizing Undergarment.
The pattern is cut in sizes 36, 38, 40, 42, 44, 46, 48, and 50 inches bust measure. Size 36 requires ⅞ yard of 36-inch material.

9600. Popular Apron.
The pattern No. 9600 is cut in sizes 36, 40, and 44 inches bust measure. Size 36 requires 2¼ yards of 32-inch material with 8¾ yards of binding.

1143. Jumper Dress for the Little Miss.
The pattern is cut in sizes 4, 6, 8, 10, 12, and 14 yards. Size 8 requires 1⅞ yards of 36-inch material with ¼ yard of 36-inch contrasting for the dress and 1¼ yards of 36-inch material for the guimpe.

1358. The Slender Silhouette the Most Popular.
The pattern is cut in sizes 16 years, 36, 38, 40, 42, and 44 inches bust measure. Size 36 requires 3⅝ yards of 36-inch material. Transfer Pattern No. 608—in yellow only—10c extra.

1164. Sailor Suit for Sonny.
The pattern is cut in sizes 2, 4, 6, and 8 years. Size 4 requires 1⅝ yards of 36-inch material with 5¾ yards of binding.

1287. Cute Dress with Matching Bloomers.
This cunning little dress is made of chambray and has a pair of matching bloomers. It is so easy to make because it is cut in one piece and is made to slip over the head. The scalloped hemline is very attractive, but for those who prefer, a straight hemline has been provided for in the pattern.
The pattern is cut in sizes 2, 4, 6, and 8 years. Size 4 requires 2¼ yards of 36-inch material with 4¼ yards of binding.

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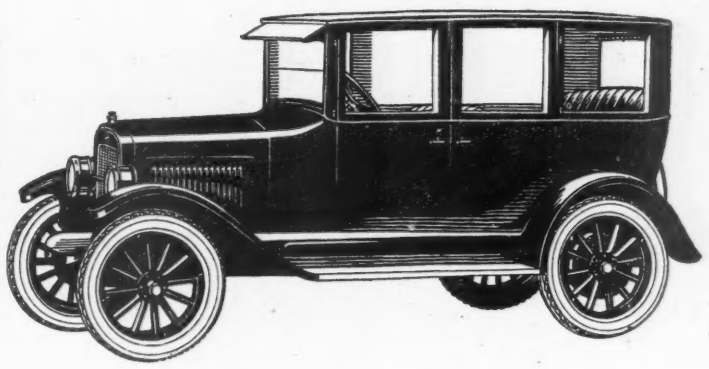

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General Spray Calendar for Apples, Pears, Quinces

for the Middle West

By T. J. Talbert, University of Missouri

What to Spray for	When to Spray	What to Use
(1) San Jose Scale. Other scale insects. Plant Lice (Aphids).	Any time after leaves drop in the fall, during pleasant weather in winter and until growth starts in spring.	Dormant or Scale Spray. Commercial liquid lime-sulphur 1 to 7 or miscible oils. This spray may be omitted if scale is not present. Arsenate of lead is not required.
(2) Plant Lice (Aphids) Apple Scab. Curculio. Canker Worms. Apple Rust. Leaf Spot. Other biting insect.	When cluster buds are separated and the pink petals show, but before the blossoms open.	First Summer or Cluster Bud Spray. Lime-sulphur (1½ to 50) see note, plus 1 lb. of dry arsenate of lead. Nicotine sulphate (½ pint to 50 gal. of spray mixture when plant lice are abundant).
(3) Codling Moth. Plant Lice (Aphids). Apple Scab. Leaf Spot. Curculio. Canker Worms. Lesser Apple Worm. Other biting insect.	Start when bloom is two-thirds off and finish before the blossom ends close. Most important summer spray, apply thoroughly.	Second Summer or Calyx-Cup Spray. Lime-sulphur (1½ to 50) see note, plus 1 lb. of dry arsenate of lead. Nicotine sulphate (½ pint to 50 gal. of spray mixture when plant lice are abundant).
(4) Apple Blotch. Sooty Blotch. Leaf Spot. Curculio. Codling Moth. Lesser Apple Worm. Other biting insect.	Within 14 to 20 days after Calyx spray. If Curculio injury is severe apply within six or seven days.	Third Summer or Curculio and Blotch Spray, Lime-sulphur (1½ to 50) see note, plus 1 lb. of dry arsenate of lead. If apple blotch is severe use Bordeaux 3-4-50.
(5) Apple Blotch. Sooty Blotch. Curculio. Codling Moth. Lesser Apple Worm. Other biting insect.	Apply 5 or 6 weeks after the Calyx spray, or if No. 4 is made within 6 to 10 days, apply No. 5 two to three weeks later.	Fourth Summer Spray. Lime-sulphur (1½ to 50) see note, or Bordeaux 3-4-50, plus 1 lb. of dry arsenate of lead. If apple blotch is severe, use Bordeaux (3-4-50).
(6) Codling Moth. Lesser Apple Worm. Apple Blotch. Bitter Rot. Sooty Blotch. Curculio. Other biting insect.	Apply about 2 or 3 weeks after No. 5 or 7 to 9 weeks after Calyx spray. Make later sprays at intervals of 10 days or 2 weeks, where apple blotch or bitter rot is serious.	Fifth Summer Spray. Lime-sulphur (1½ to 50) see note, or Bordeaux 3-4-50 plus 1 lb. of dry arsenate of lead. If apple blotch or bitter rot is serious use Bordeaux, 3-4-50.

Lime Sulphur Solution.—Where spray guns are used it may be advisable to dilute the the lime sulphur at the rate of 1¼-50 on account of danger of burning foliage and fruit. Lime-sulphur as referred to in the spray calendar means commercial solution testing about 33° Baume. Lime-sulphur is more apt to burn in dry hot weather while Bordeaux is most dangerous in cool cloudy weather.

Blotch and Bitter Rot.—If the orchard is practically free from blotch and bitter rot, lime-sulphur solution may be used instead of Bordeaux in Nos. 4 and 5.

Sprays Required.—All the above sprays are not likely to be needed. A study of the insects and fungus diseases common in the orchard will help the grower arrange a schedule adapted to his particular needs. The sprays ordinarily needed are 2, 3, 4 and 5 in the northern half of Missouri, while in the southern half, 5 or more sprays are generally required.

Bordeaux Mixture.—Bordeaux has reference to Bordeaux mixture made according to the 3-4-50 formula (3 lbs. bluestone, 4 lbs. quick lime to 50 gallons of water.

BORDEAUX MIXTURE

The following formula for making Bordeaux mixture has given very satisfactory results in spraying demonstration work:

Blue vitriol (copper sulphate)	3 pounds
Stone lime (unslaked)	4 pounds
Water	50 gallons

If only 50 gallons of the Bordeaux is to be made, dissolve the copper sulphate or bluestone in two or three gallons of water. Hot water will hasten the dissolving of the bluestone. Make the solution up to 25 gallons by adding water. Slake the lime in another container and make it up to 25 gallons with water. The two solutions should be kept separate until ready for use when they should be poured together at the same time through a strainer into the spray barrel or tank. Bluestone may be easily dissolved over night by placing the amount needed in a gunny sack and suspending it in a barrel just beneath the water.

Since the copper sulphate solution injures iron or tin containers, it should be prepared in stone or wooden vessels.

Where greater quantities of Bordeaux are to be made, the work may be greatly facilitated by dissolving and slaking larger amounts of copper sulphate and lime. Stock solutions containing two pounds of copper sulphate and two pounds of lime to the gallon may be prepared in separate barrels, or other containers, and kept for an indefinite period, if evaporation is prevented.

The most satisfactory way, however, of preparing large quantities of Bordeaux is by means of an elevated platform higher than the spray tank. On this platform may be placed the stock solution containers, dilute solution containers and other needed equipment. By elevating the stock solutions and connecting the containers by means of pipes, the mixing may be easily made by gravity. Water should also be supplied by a tank or pump.

Arsenate of Lead Paste.—The paste form of arsenate of lead may be used instead of arsenate of lead powder or the dry form. For all practical purposes, one form is as effective as the other. Since the arsenate of lead paste is 50% water, use twice the amount recommended for the dry form. Most orchardists now prefer to use the dry arsenate of lead.

General Spray Calendar for Peaches, Cherries and Plums

What to Spray For.	When to Spray.	What to Use.
(1) Peach Leaf Curl. Brown Rot. San Jose Scale.	Any time after leaves drop in fall, during nice weather in winter and until just before growth starts in spring.	Commercial lime-sulphur (1 to 7). If scale is not present, use Bordeaux mixture, (4-4-50), or lime-sulphur solution (2 to 50).
(2) Curculio. Other biting insect. Peach Scab. Cherry Leaf Spot. Brown Rot. Plant Lice (Aphids).	Apply after blooming and when most of the shucks and blossoms are off the fruit.	Arsenate of lead dry ¾ lb. in self-boiled lime-sulphur (8-8-50), or in 50 gallons of water to which is added milk of lime from 2 to 3 lbs. of stone lime. Add nicotine sulphate ½ pint to 50 gal. spray if plant lice are injurious.
(3) Curculio. Other biting insect. Brown Rot. Peach Scab. Cherry Leaf Spot. Plant Lice (Aphids).	Apply 6 to 10 days after shucks and blosoms are off. If curculio is not serious 2 weeks after shucks and blossoms are off.	Self-boiled lime-sulphur (8-8-50) plus ¾ lb. of dry arsenate of lead.
(4) Curculio. Other biting insect. Brown Rot. Peach Scab. Cherry Leaf Spot.	Apply 2 to 3 weeks after No. 3 or at least 3 weeks before fruit ripens.	Self-boiled lime-sulphur (8-8-50) plus ¾ lb. dry arsenate of lead.

Explanation of Spray Calendar for Stone Fruits.—Where San Jose scale and Peach Leaf Curl are not present, sprays No. 2 and No. 3 will generally afford sufficient protection.

During wet season, Elberta and later varieties of peaches may need later applications of self-boiled lime-sulphur (8-8-50), but in no instance should any variety of stone fruit be sprayed with this mixture later than three weeks before picking time.

Preparation of self-boiled lime-sulphur:

Good stone lime (not air-slacked)	8 pounds
Flowers of sulphur	8 pounds
Water	50 gallons

Place lime in a barrel or vat. Add a bucket of water to start slacking. When slacking is well started, add another bucket or so of water, then add the sulphur. Keep lime and sulphur well stirred to prevent caking. Add water as needed to keep the mixture from drying or burning. When slacking ceases, add water to make up to 50 gallons. Strain into spray barrel or tank.

Amount of Spray Needed for Trees of Various Ages.—The amount of spray required for each tree will depend upon the size of the tree and the thoroughness of the spraying work. In general the amount needed per tree for apple, pear, peach, plum and cherry trees does not differ greatly until the trees are about 10 years old. After this age is reached the apple trees will usually need from 1 to 6 or 7 gallons more spray per tree than the pear, peach, plum or cherry. Trees from 1 to 3 years old will require approximately ¼ to 1 gallon each, trees 3 to 5 years, ½ to 2 gallons each, trees 5 to 7 years, 2 to 3 gallons each, trees 7 to 10 years, 3 to 4½ gallons each, trees 10 to 14 years, 3½ to 5 gallons each, trees 14 to 18 years, 4 to 7 gallons each, trees 18 to 24 years, 5 to 10 gallons each, trees 24 years old or over may require from 8 to 14 gallons each.

How to Calculate Amount of Spray Materials to Buy.—Dormant or Scale Spray.—To determine the amount of lime-sulphur to purchase, multiply the number of trees about the same age by the amount per tree as estimated above. Then multiply this by the number of sprays to be made, and divide the total by 350. The result will be the number of 50 gallon barrels of concentrated lime-sulphur solution that should be purchased. A 50-gallon barrel of lime-sulphur solution diluted at the rate of 1 gallon of the concentrated solution to 7 gallons of water will make approximately 350 gallons of spray.

Lime-Sulphur for Summer Sprays.—A 50-gallon barrel of lime-sulphur solution diluted at the rate of 1½ gallons of the strong solution to 50 gallons of water will make approximately 1,700 gallons of spray. To find the quantity of lime-sulphur required, calculate as indicated above by multiplying the number of trees about the same age by the amount estimated per tree. Then multiply by number of sprays to be made and divide by 1,700. This will give the number of barrels to be purchased for the summer sprays.

Arsenate of Lead.—Multiply the number of trees of the same age by the estimated amount of spray needed for each tree, then multiply this by the number of sprays to be made, and divide by 50. This will give the number of 50 gallon lots required. Now, multiply this by, 1, 2 or 3, depending upon the pounds of dry arsenate of lead or paste arsenate of lead you expect to use for each 50 gallons of spray. The product obtained will give the number of pounds arsenate of lead to purchase.

PRACTICAL HINTS TO REMEMBER IN SPRAYING APPLE TREES

1. Weigh or measure accurately all spraying materials and use them according to directions. If it is desired to experiment, do it in a small way and remember that at least three or four seasons' results should be secured before the practice is adopted for the whole orchard.

2. Apply the sprays at as nearly the proper time as possible and remember that the leaves and fruits are not protected unless they have been thoroughly covered with the spray. Unsatisfactory results are more often due to poor spraying than to other factors.

3. Apply the spraying mixtures as soon as possible after they are diluted and mixed for use. If any of this spraying solution is left in the spray barrel or tank after the work is finished, pour it out or use it in respraying a few trees. It is not advisable to keep the diluted and mixed spraying solution until time for the next application. Chemical changes may occur in the lime-sulphur arsenate of lead or bordeaux arsenate of lead solution after standing for a time and if applied to apple trees it may russet or burn the fruit and foliage badly.

4. Use the standard spraying mixtures until you are convinced either by your own observation or by the observations and experiments of the College of Agriculture that the new materials are equally as good or better than the old.

5. Know when to spray, what to use, how to apply the spray to the best advantages, and what insects and diseases it is necessary to control.

6. Before the spraying season begins secure enough spraying materials for at least two applications. This is necessary because there is only about seven to ten day's time between the first and second summer sprays. Delays in ordering spray materials may mean the loss of a fruit crop.

7. Spraying materials if properly mixed, diluted and applied seldom do material injury to the leaves or fruit. Where injury is observed, however, study it carefully and be sure that the spray mixture is at fault before making radical changes in the spraying solution. Frost injury, fire blight, black rot and other factors that may do harm are often mistaken for spray-burn injury.

8. Use spraying equipment capable of doing the work required. Needed spraying accessories, such as better nozzles, spray rods and hose may mean the success or failure of the spraying work.

9. The practice of employing someone to spray the orchard often results in considerable expense and unsatisfactory fruit. It is usually advisable to spray your own orchard or lease it upon a share or cash basis.

10. Clean the spray tank or barrel, hose, rods and nozzles after each spraying by pumping clean water through them. Detach or oil the metal parts of the outfit which are apt to be difficult to adjust or remove as a result of the action of the spray.

11. To prevent injury to the face and hands from contact with the spraying solution, smear a heavy coat of vaseline on the face, wear a slouched hat and a pair of mule-skin gloves which should be kept thoroughly coated with axle grease.

12. In applying the third, fourth and later summer sprays, if the weather is hot and bright the lime-sulphur solution may burn the fruit. Under such conditions bordeaux 3-4-50 and arsenate of lead is recommended. It is also true that bordeaux is more apt to burn during cloudy, cool weather than lime-sulphur.

13. The recommendations made in this publication are adapted as far as possible to the general conditions prevailing in the fruit-growing sections of Missouri. Every fruit-grower should study carefully, however, the conditions in his own orchard, including the insect pests and plant diseases, in order to be able to work out a spraying program best adapted to his own particular needs.

NEW OIL SPRAY FOR SAN JOSE SCALE

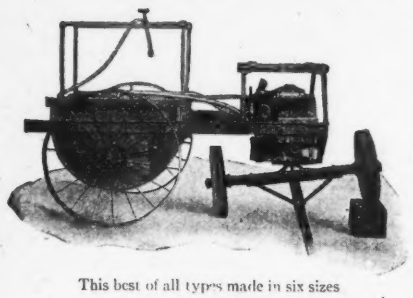
The fruit growers of Southwest Missouri and Northwestern Arkansas believe that they have found a more effective and economical spray for the control of San Jose scale in the so-called Red Engine Oil—Fish Oil Solution, now being investigated by A. J. Ackerman, of the office of Deciduous Fruit Insect Investigations, U. S. D. A.

The formula for the stock solution is as follows:—Red Engine Oil, or oil of similar grade, 1 gallon, water 1½ gallon, Potash Ash, Fish Oil Soap, 1 lb.

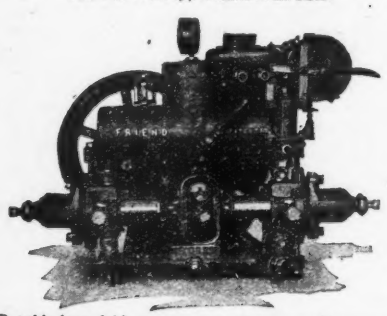
The oil, water and soap are placed in a kettle or other receptacle and heated until the contents come to a boil after which the kettle is removed from the fire and the entire mixture is pumped twice under pressure of about 60 lbs. while it is still hot.

While this oil mixture as a spray against San Jose Scale has been used for only about one season, the results accomplished appear very promising. It is claimed that this mixture when used as a spray has successfully destroyed the scale and brought it under control where other sprays like lime-sulphur solution and other miscible oils have utterly failed. It is also stated that the new oil mixture can be used at a cost of about one-third the price of lime-sulphur solution.

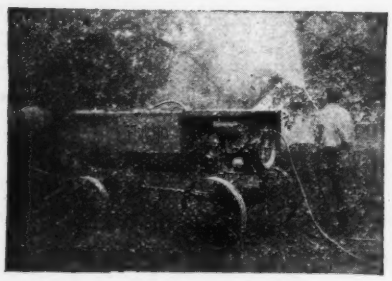
The possible injury of the oil spray which may result to the trees, twigs and fruit buds has not been determined and several seasons' experience will be necessary before a final decision on the question can be reached.



This best of all types made in six sizes

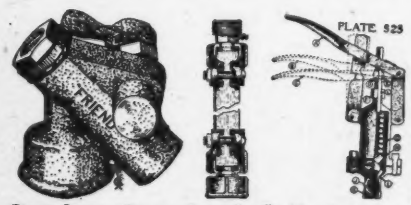


Put this dependable motorpump unit on your old sprayer and spray as you have never sprayed before. Four sizes



This type of sprayer if you want it at less cost

There's a SECRET at the Arrow Point
Thousands of Up-To-Date Fruit Growers are saying, "FRIEND NOZZLES ARE SUPERIOR."
Why is this?
"FRIEND" MFG. CO.



Power Sprayer Pressure Controller, Leakless hose coupling, Angle leakless shutoff. Full line best sprayer fittings

The World's first and best spray gun

Send for new catalog

"Friend" Mfg. Co., Gasport, N.Y.

Pests of Florida

(*Continued from page 20*)

velopment of the penetrating hyphal threads.

Six different forms of parasitic fungi have been found on white fly, of which the red aschersonia and brown are the most important. Four forms have been found on scale the most important being the red headed and gray headed. A method of growing the red aschersonia on sterilized sweet potatoes has been found, cultures of which are prepared and sold to growers at cost by the State Plant Board. These may be gotten at the beginning of the rainy season the spores dissolved off in water and sprayed on white fly infested trees. So far no other forms have been produced artificially with sufficient ease and rapidity to make it practicable. The leaves or twigs on which these are found may be taken, soaked in water, which is then sprayed on infested trees.

As the larvae are more easily destroyed when young, it is advisable to watch for the appearance of a brood, especially of the white fly, which can easily be determined by the adults being on the wing in great numbers; about ten or twelve days after all adults have disappeared, to give the eggs time to hatch, is the best time to spray. Oil emulsion sprays give best results for the spring and fall broods of both white fly and scale. Fortunately the broods of each come so near together that the sprayings may be effective for both. Spraying with parasitic fungi should be made for the summer broods.

The Rust Mite

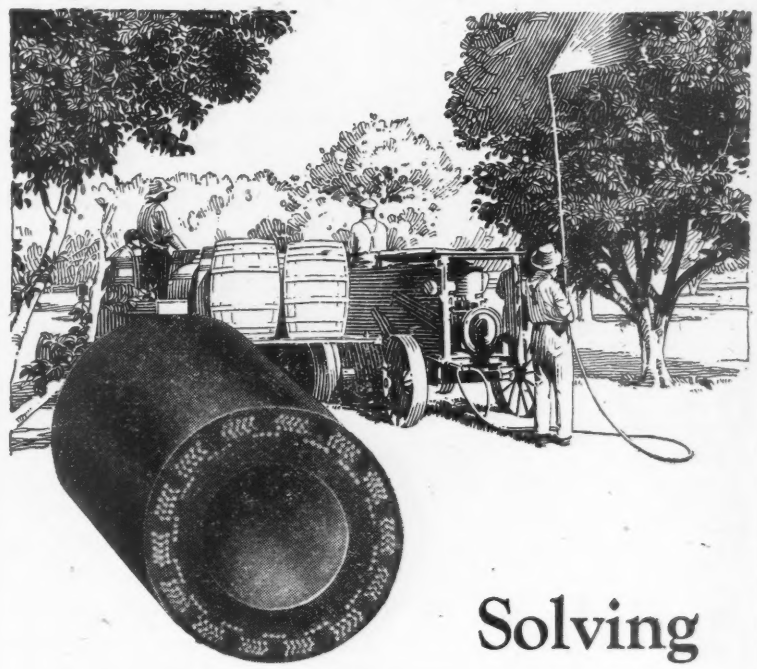
The rust mite (Eriophes oleivorus), called the silver mite in California, sucks the oil from the oil cells which are numerous in leaves and rind of fruit. The attacks on the fruit cause a russeting which renders them less attractive thus lowering the price, the size is also reduced, and the trees weakened by the injury to the leaves. These mites thrive best in dry weather, hence are usually most active about June and November. The six spotted and purple mites, often called red-spiders because of the reddish twinge of the adults, suck the juices from the leaves, and sometimes become numerous enough in dry weather to require control measures. For all mites some form of sulphur is the best remedy. Dusting is cheaper and when thoroughly done is quite satisfactory, though spraying with some form of soluble sulphur is more often done, as the grower must have some spray machine for other pests. It is important that the grower be able to identify these mites, which is difficult, as they are very small; keep a sharp lookout for them in the warm dry periods of spring and fall and apply the remedy promptly.

The Plant Bugs

The large plant bugs, chief among which is the green soldier bug (Nezara viridula) suck the sap from twigs, leaves, and juices from fruit in the fall and often cause the fruit to drop. These bugs are oval in outline about one-half inch long, one-fourth inch wide and of a bright green color. They attack cover crops grown between the tree rows. When these are cut the bugs may go to the trees. Beginning the cutting next the trees and progressing toward the middles drives them away from the trees and most of them never reach them.

No spray is safe to use that is strong enough to kill bugs of this size. Large nets made of muslin are held under branches of infested trees, the limbs above being given quick vigorous shakes, the bugs fall into the net and are quickly killed by being dipped into a bucket containing kerosene. This must be done when the weather is cool which causes the bugs to become sluggish. This treatment is good for all large plant bugs, such as the brownish stink bug, leaf footed bugs and others.

(*Continued on page 39*)



Solving Spray Hose Problems

To meet the more exacting demands of present day usage Goodrich offers a super-quality spray hose.

It is light, flexible, easy to handle yet has the body to resist extreme pressures and injurious expansion. A rubber tube that withstands oil emulsions without softening, and a tough cover built for hardest wear, round out a hose that you can rely on.

Freedom from trouble, long life, unfailing satisfaction, make it a pleasure and an economy to use the new Goodrich Spray Hose. Write to our nearest office for a sample and prices. That is the first step in overcoming spray hose troubles.

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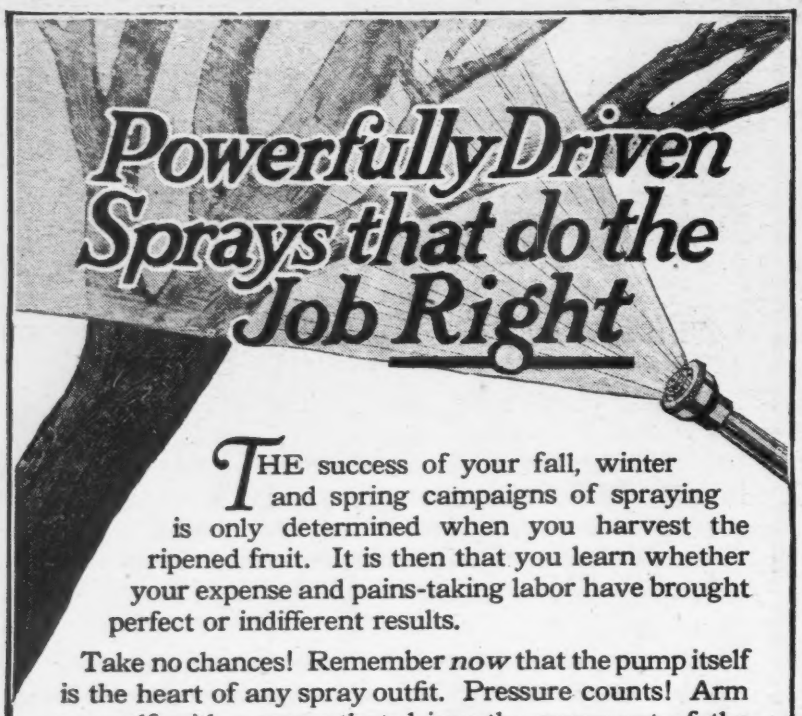


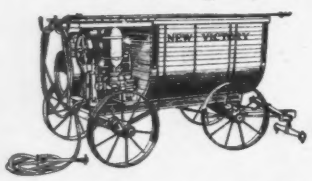
Powerfully Driven Sprays that do the Job Right

THE success of your fall, winter and spring campaigns of spraying is only determined when you harvest the ripened fruit. It is then that you learn whether your expense and pains-taking labor have brought perfect or indifferent results.

Take no chances! Remember *now* that the pump itself is the heart of any spray outfit. Pressure counts! Arm yourself with a pump that drives the spray out of the nozzle with a penetrating force which reaches the deep recesses and hidden crevices that serve as the enemies' strongholds.

Depend on Deming Pumps to do the job—*right!*

"New Victory" Power Sprayer



All the features you have wanted at a price you can afford to pay. Strong, compact and light weight for easy handling on hillsides or soft ground. Powerful Duplex Pump delivers 12 gallons per minute under 300 lbs. pressure; Chain drive; Friction clutch; Automatic Pressure Regulator; "New Way" 5 H. P. air cooled motor; Bosch magneto.

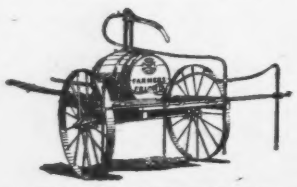
The "Comet" Long Distance Spray Gun

Use with any power outfit. All brass; weight only 2½ lbs. Interchangeable discs changes capacity. Grip control graduations from a fine mist to the coarse long distance spray.

"Century" Barrel Sprayer

The premier of all barrel sprayers; awarded first honors National Horticultural Congress. Will supply two leads of hose. Used for general spraying, disinfecting, whitewashing, etc. Rugged, powerful, but easy working pump, all working parts brass.

The "Farmer's Friend" One-Horse Rig



Hardwood platform and shafts. 3 inch tired steel wheels, 50 gallon tank. Easy working powerful hand pump will supply two leads of hose. Converted into field crop sprayer by simply adding Deming 4 Row Spray Boom.

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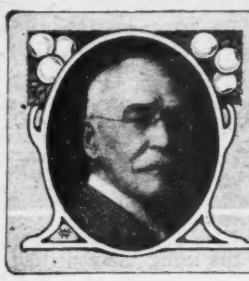

Charles A. Green's Walks and Talks With Readers

The Storage of Apples

THERE is a vast difference in the keeping qualities of different varieties of apples. Ben Davis is one of the longest keepers and can be marketed at Rochester, N. Y., in April if stored in a fairly cool place. Spy is a good keeper, but it has a tender skin and is therefore liable to decay on that account, for if the skin is punctured, even though a small puncture, the fruit will not keep. Baldwin is a fairly good keeper, often found in prime condition in April in an ordinary cellar. McIntosh is an early winter apple ready to eat from November to January. Banana is a long keeper. Blenheim is early winter but keeps well towards spring. Duchess is a fall apple. King is a fairly good keeper.

Apples like potatoes keep better in the dark. Apples need ventilation. Bushel crates are desirable for apples placed in the house cellars for winter use. Apples will not keep in a warm cellar. They will keep much better in an outside building. Where there is danger of frost they can be covered with blankets, cornstalks, straw or hay. In old times apples were stored in pits, much the same as potatoes are stored today, but there is considerable work connected with this method of keeping winter apples.

Is Snow the Fruit Grower's Friend?

YES and no. Snow is everybody's friend inasmuch as it has been assumed by authorities that there are more nitrates in a downfall of snow than in a downfall of rain. It is friendly also to fruit growers owing to the fact that it is not desired that the soil shall be frozen to a great depth during winter. Snow forms a very warm covering for the earth. There is scarcely any other object that is so warm as a blanket of snow. My opinion is that a few inches of snow is warmer than a woolen blanket of the same thickness, but I have no authority for this statement other than my own personal opinion. One reason why snow is so warm is that it contains so much air space between the flakes and the particles.

Snow is not friendly when it banks up five or six feet high and breaks down the small orchard or nursery trees or the raspberry plants. We avoid this crushing of the branches of young trees in the nursery when the snow is deep by tramping down close to the row of trees on either side. This remedy is operative owing to the fact that the snow bank or the deep snow after a thaw settles some times six inches or a foot, carrying with its great weight the lower branches of the young orchard or nursery trees.

Is This a Good Time to Plant Orchards?

WHAT is the prospect for profits in peach and apple orchard culture at the present date?—R. Lee.

C. A. Green's reply: There have always been doubters in regard to tree planting. Some people have doubts about everything with which they are connected. Others are too rash and go beyond their means.

The first large orchard I ever saw was planted fifty years ago about five miles south of Rochester and embraced about forty acres. At that time when fruit growing was in its infancy this venture was looked upon as hazardous. We were told that such a large orchard could not be profitably conducted and that there would be no sale for the fruit and that the fruit would go to waste and that they could not get pickers and packers. At a little later date a man twenty miles farther south of Rochester planted an orchard of fifty acres. He was warned by his friends that he was going too deep and that the prospects were he would meet with failure. At that time there were no notable western orchards. Orcharding consisted, when it existed at all, in an acre or so of land planted to apple trees.

At the present time most fruit growers are astonished to hear that there are not existing either east or west enough apple orchards to supply the public in the years to come. This will seem strange to many, but the fact is that we are apt to think only of the planting done each year, whereas there is a serious decline in many orchards through lack of skill or enterprise and thus the orchard planting is not so large as the orchard waste or decay. The governors of fruit growing states have expressed their alarm at the diminishing planting of orchards and have taken steps to remedy the seeming evil, for it would be a very serious menace if the size of the orchards or numbers of the country should be reduced so as to lessen the capacity of the orchardists for more extensive planting.

There is one drawback to the planting of orchards at this date and that is increasing cost of growing trees and the increasing cost of product to the planter. Many things have brought about this condition, the main reasons being the high price of labor and the high price of everything connected with the growing of plants, trees and vines. But is the price of trees likely to be lower in the years to come? No one can answer this question definitely, but the general opinion is that nursery products will never be so low again as they were previous to the World War. Considering all these points, I would say that the times are favorable to the planting of orchards in moderation and especially of apple and peach trees.

Are Apples More Attractive Than Pears?

WHICH do you think most people like best, apples or pears?—Rita.

C. A. GREEN'S Reply: I have been for years carrying occasionally a basket of nice apples to my office workers. Finding that the apples were more generally and frequently eaten than the pears, I asked: "Which do you like best, apples or pears?" The reply came very speedily: "We like apples best." This was a surprise to me, but when I come to analyze my own preference I think I would agree with my office workers that though both pears and apples are good to eat, the apple is the most attractive fruit.

As regards color, the apple is far more attractive than the pear, although some pears have rosy cheeks and yellow coverings.

When I was a boy on the farm my brother brought from the city three pears that looked something like the Bartlett. It was a great treat for me to have a part of one of these pears. If anybody had asked me then which I liked best, apples or pears, I should have said pears, but I believe this was owing to their scarcity. I knew of no farmer in those early days who had an improved variety of pear on his place.

So far as utility is concerned, the apple is far more useful than the pear. Apple pie is prized by almost everyone and apple sauce is noted for its aid to digestion, and apple dumplings do not have to beg their way through the land. But after all, if we were to secure votes on this question we would find that people are pretty evenly divided in their preference for the pear or the apple.

Florida Pests

(*Continued from page 37*)

Serious Diseases

Citrus Canker is the most serious disease that has been found attacking citrus. It is caused by a bacterial organism, which cannot be reached by any spray remedy. By destroying infected trees by fire as soon as discovered and sterilizing the soil about them this disease has been practically stamped out. A force of inspectors is kept on suspected or exposed property to check outbreaks.

Withertip caused by the fungus colletotrichum gloeosporioides is a disease quite common over the State. It may attack trees of any age or variety, causing the dying back of twigs and branches. The same fungus causes brown spotting of fruit, bloom blight and the shedding of newly formed fruit. This fungus is carried over from one season to the next in the dead and diseased branches. Careful pruning out of these is very important. Thrifty vigorous growth is seldom attacked, so keeping trees in good growing condition is a valuable preventive.

Foot-rot is destructive mainly in the old seedling groves on the moister soils. It attacks trees on rough lemon stock to a limited extent. It has recently been found that it is caused by the fungus Phytophthora terrestria which thrives best in the soil of moist shaded places. It attacks trees at or near the surface of the ground causing decay of the lower trunk and main roots to a distance of a foot or more from point of attackment to trunk. By using sour orange stock for budding this disease may be prevented, as the sour orange is immune to it. Diseased trees are treated by digging away the earth from about them, cutting out all diseased tissue and painting the cut surfaces with corrosive sublimate, carbolineum, or other antiseptic.

Citrus Gummosis

Gummosis is a disease of the bark which appears mainly on the trunks and larger branches of bearing trees. The cause is unknown. The attacked parts are scaly, ulcerated and gummy in appearance covering a few square inches to a foot or more, sometimes girdling the limb. The diseased area should be cleaned of all marks of the infection by cutting and scraping, then treated with an antiseptic.

Scaly bark is chiefly a disease of the sweet orange caused by the fungus Cladosporium herbarum var citricolum. It attacks the bark, fruit and occasionally leaves, starting as small round or oval spots becoming one-fourth to one-half inch in diameter. These may extend until they blend producing an appearance much like gummosis except lacking the gum exudation. The fruit is marked by brown sunken spots some of which form sunken rings. These render the fruit unsalable. The most satisfactory remedy is to top work affected trees to grape fruit or tangerines, which are highly resistant to this disease.

The Die Back

Die back is probably a physiological trouble brought about by the tree taking from the soil certain substances which cause an abnormal growth or development. It may show in branches, leaves and fruit. The characteristic symptoms are gum pockets, stained terminal branches, ammoniated fruit, bark excrescences and multiple buds. Usually trees in the early stages show a very deep green color with leaves large and vigorous. It is thought that a large amount of organic ammoniates frequently cause it; therefore the leaving out of these in fertilization often helps. Stopping cultivation sometimes proves beneficial. Applying two or three pounds of copper sulphate about each affected tree as fertilizer is applied is the best chemical treatment.

Melanose is a disease that attacks leaves, young twigs and fruit. It is caused by the fungus Phomopsis citri. It attacks especially succulent, growing tissue producing small, circular, raised brown spots. Often these run

(*Continued on page 41*)

Blasted Holes Bring Better Yields

A quicker, larger yield of fruit follows blasting with Dumorite preparatory to digging tree-holes, because it—

thoroughly loosens and shatters the subsoil
makes root penetration easy
puts great stores of plant food within easy reach
destroys fungus and nematode
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And although Dumorite shoots stick for stick with 40% dynamite, you get ⅓ more sticks per dollar. It is non-freezing and non-headache. One-half stick per hole is the usual charge. Buy it from your local dealer.

Write for free 110-page "Farmers' Handbook of Explosives," describing the latest methods of tree-planting, land-clearing and ditching.

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growing strawberries from Keith's new-land plants. We guarantee our plants to be strong, healthy, true to name and to give entire satisfaction or we refund your money. No better plants are grown anywhere. They are certainly the best you can buy and they are guaranteed to reach you in good growing condition. We ship them well packed, direct from our Nursery. We supply **you with a free copy of Keith's Ways to Successful Berry Culture with your first order.** We have a splendid stock of Keith's Everbearing strawberry plants, as well as the well-known standard varieties, also grapes, raspberries, blackberries and other small fruits, all illustrated and plainly described in our handsome new catalog which is now ready for you. **It is full of valuable information, illustrating growing fields and fruits.**
Write for it before placing your order. We advise you to let us have your order as quickly as possible so that you may be sure of just the kind you want. **It's FREE, send today, receive it tomorrow.**
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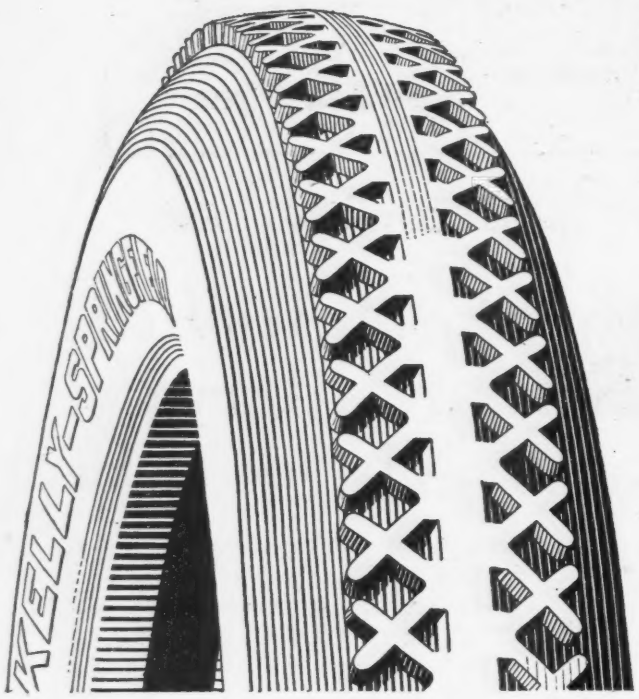
KELLY SPRINGFIELD TIRES



WHEN a tire fails to give satisfactory mileage it may be the fault of the rough country roads, but it is more likely to be the fault of the tire itself.

Good tires will give more service on poor roads than poor tires will on good ones.

Kelly-Springfield tires are built to give service. For over a quarter of a century they have been famous for their high quality.

The Kant-Slip Cord, the newest member of the Kelly family, not only gives long mileage on rough roads but is a wonderful non-skid tire on smooth ones. It is the longest-wearing tire Kelly has ever built and the safest tire *anyone* has ever built.

Kellys used to cost more than other tires, but now that the huge new Kelly-Springfield plant has been completed and production greatly increased.

It costs no more to buy a Kelly

WITH THE CO-OPS.

THE White County Farm Bureau of Arkansas has recently organized a strawberry shipping organization which will be known as the White County Farm Bureau Strawberry Growers Co-operative Association. It will ship berries this coming year from McRae, Garner, Higginson, West Point, Kensett, Searcy, Bradford, Pangburn, Russell, Cabot, Newport, Tuckerman and Griffithsville.

Askansas has been coming to the front very rapidly as a strawberry shipping district and we wish this new co-operative the best of success.

ALL co-operative associations in the United States will be interested in a news statement sent out by the Federal Reserve Board which announces an amendment to its Regulation B which makes eligible for purchase by Federal Reserve Banks on the open market bankers' acceptances with maturities up to six months which are drawn by growers or by co-operative marketing associations to finance the orderly marketing of non-perishable, readily marketable, staple agricultural products when secured by warehouse receipts covering such products.

An amendment of this nature has long been needed by the co-operatives and will prove to be of great financial aid to them.

ON January 23rd and 24th grape growers from several eastern states and from Canada met at the Hotel Lafayette in Buffalo, N. Y., to reorganize the National Grape Growers' Association, the aim being to make it an International Concord Grape Growers' Association. Many grape growers' associations throughout New York and other parts of the east stated they would have representation at the meeting. The Farm Bureau Federation for some time has been interested in this movement and has been assisting the grape growers' co-operative associations in such states as New York, Pennsylvania, Ohio, Michigan and Ontario, with the hope of perfecting eventually a central organization. It is hoped that all the grape growers' associations in the east will become members of the central organization.

THE Eugene Fruit Growers' Association of Eugene, Oregon, is one of the most successful in the United States. They started in during 1908 with a small beginning of about $14,000 worth of business and have grown gradually until today they have one of the finest canneries in the Pacific Northwest, a large vinegar works, box factory, lime and sulphur plant, prune drying and processing equipment, a fresh fruit department, and own the local ice cream and ice manufacturing plant. All of these lines are being operated at a profit. J. O. Holt is a very efficient manager. He has learned to work with a very small overhead and few men utilize their time to better advantage than he does. He has developed one habit which all managers of co-operative associations should cultivate, viz: always looking four or five years ahead. Right now, if you would talk with him you would find his best thoughts were devoted to the future of the organization from three to five years from now. Mr. Holt had the largest prune dryer in the world last year, with 65 tunnels. He is adding to this so it will ultimately have 97 tunnels.

GOVERNMENT MERCHANDISE!

S-M-A-S-H-E-D P-R-I-C-E-S!

Here is a sale of real bargains—the biggest snaps we have ever offered. Freight rates are now reduced—buy today. These prices are guaranteed for 60 days and these offers are in effect only while this stock lasts. So don't delay—buy direct from this "ad."

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No. PN 168—Only a few left. Practically all steel. Round like a nest. No cold corners. Big Hatch always. Capacity, 70 eggs. Each $5.25

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36 inches high; per bail..... $2.40

Lot No. PN 300, 72 inches high, per bail..... $4.75

Per 100 lbs. **Mixed Nails** $1.95

New wire nails in all sizes from 3 to 40d, handy assortment for every purpose. Lot No. PN 400, per 100 pound keg,.... $1.95

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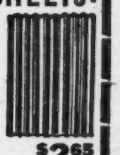

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Write for Special Bargain List No. PN-3

HARRIS BROTHERS CO. 1349-1525 West 35th St., CHICAGO

Florida Pests

(*Continued from page 39*)

together forming irregular masses or bands. It renders fruit rough and unsightly reducing its value. Stem end rot has within recent years been found to be a different manifestation of the same fungus. It attacks the stem end of mature fruit causing it to drop and rot. Sometimes fruit is infected just before or at time of harvesting, does not show up in packing house, but decays in transit, causing serious loss to the shipper. The spores develop in dead wood and the rind of decaying fruit; pruning out the one and destroying the other are important means of control.

Citrus Scab

Citrus Scab attacks leaves, young twigs and fruit of sour orange, lemon, grape fruit and sometimes tangerines, causing irregular scabby masses and wart like elevations. It is rarely if ever found on the sweet orange. It is caused by the fungus Cladosporium citri and is of great importance now on grape fruit, having become more virulent on this in recent years. It attacks sour orange seedlings grown for stocks in the nursery rows. Spraying with Bordeaux, lime-sulphur or other fungicides is best method.

There are some other diseases of minor importance occasionally found.

As the fungi that prey on white fly and scale insects are destroyed by fungicides, they should not be used except as a last resort, and then insecticides should accompany or soon follow them.

Trees kept free from diseased and dead wood by careful systematic pruning, given proper fertilization, cultivation and spraying for insect pests will seldom need fungicides.

Blister Canker

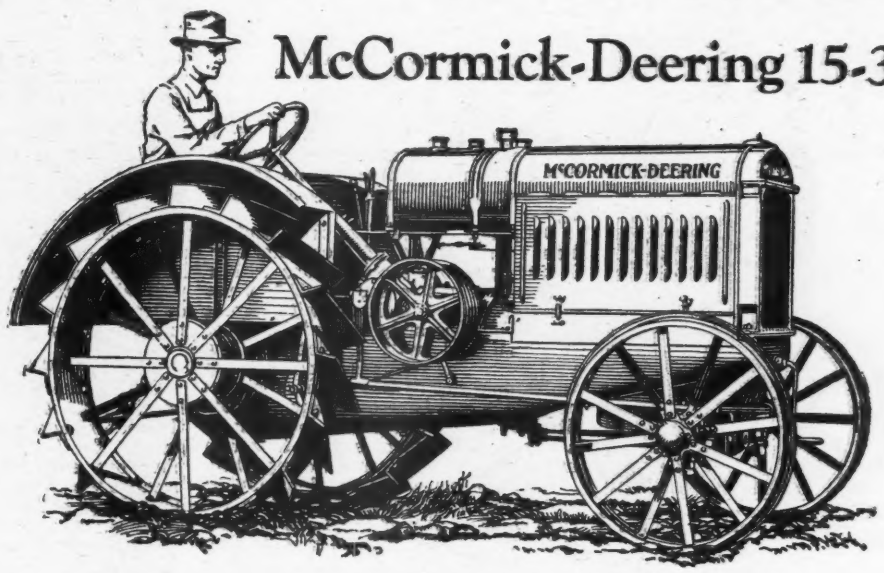
(*Continued from page 23*)

to the next tree the tools should be sterilized by washing in a strong solution of copper sulphate. All limbs cut out by diseased trees should be removed from the orchard and promptly buried. Workmen pruning diseased trees should not work on healthy trees.

The question may be raised at this point as to why we remove the cankered bark when the disease is deep seated. Will it not appear in future years? In our discussion of the life history of the fungus we stated that the "seeds" are produced on these external cankers. The object, therefore, of cutting out the cankers is to remove the seeds and thus prevent the fungus from spreading to other trees. Those trees which now have the disease are usually too far gone to be cured, although in many instances I have succeeded in eliminating the disease by promptly cutting off a limb at the trunk of the tree which had the canker near the top.

Since the disease continues to live in the tree it is evident that the orchard must be gone over again before new fruiting bodies are produced. Fortunately it usually takes over a year for new fruit bodies to form so that an annual cutting out of the cankers is sufficient to hold the disease in check. Usually the canker advances an inch or so about the old cut-out portion but it may spread much more rapidly, especially above and below the old cankered area. The labor of the second and subsequent years is not great as compared with the first. When the work is well organized it takes only a few minutes for each diseased tree. Careful watch should be kept for new cankers on the unmarked trees since it sometimes takes several years for the cankers to form and thus the first survey may not locate all the diseased trees.

Orchards showing over fifteen per cent of infection are usually too far gone to warrant complete treatment as described above, unless younger orchards are being planted in the neighborhood or replants are being made. In such old orchards, however, all diseased limbs should be promptly removed as soon as they no longer bear a profitable crop.



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Ball and Roller Bearings

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Practical design, ease of operation and handling, make the McCormick-Deering tractor an ideal three-plow power unit. It also develops a surplus of power to handle a great variety of belt jobs (threshing, silo filling, husking and shredding, feed grinding, etc.) and its smooth, flexible operation and increased speed make it a leader for all kinds of drawbar work.

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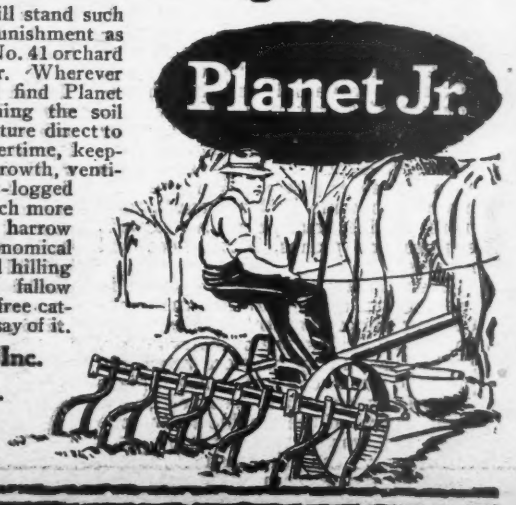

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This mark and the name "Planet Jr." identify our products

Insect and Disease Control

By C. I. Lewis

Adult of the grape root worm which is very destructive on eastern grapes

MUCH progress has been made in the past decade in the control of our insect and disease enemies. An analysis of the outstanding insects and diseases of this country at the present time would show the following: On the Pacific slopes, the codling moth; in the Rocky Mountain district, the leaf roller; in the Middle West, the blister canker and San Jose scale; in the east, fungus diseases of the apple and San Jose scale; in Michigan and other cherry districts, the cherry leaf spot, while nationally we have the fire blight, the heart rot, the peach borer and the mosaic diseases. With nearly all of these enemies, much progress has been made but, of course, there is a great deal as yet to be done.

With most of our bacterial diseases and also with the majority of the functional troubles little progress has as yet been made. The common chewing and sucking insects and the fungus diseases can now be handled with a reasonable degree of success.

Work of the apple maggot

Machinery Development

There has been a wonderful machinery development in the past few decades. A few years ago a state like Illinois had only a few low-powered outfits where today the state is well supplied with large high-powered machines. From the Atlantic to the Pacific the watchword is more and more power. Ten years ago we were proud of our two and a half and three horsepower outfits compared with the hand outfits we used to use. Today in many districts the growers are using ten and twelve horsepower outfits and some even a greater power. With the high power has come better manufacture, more efficient machinery as regards engines and pumps, better hose and nozzles.

There is a difference in opinion in the country at the present time concerning the comparative merits of the spray gun against the ordinary nozzle. In the east many growers are dropping the gun because they say it gives a coarse spray which does not give a good control of the trouble on the one hand and wastes the spray or leads to injury on the other hand, while in some of the eastern districts where fruit growing is a specialty and in practically all the western districts the spray gun is still popular because the growers say it means less labor, it is cheaper in the long run, it gives a better cover of the spray in that a fine mist can be obtained and results in better control and really less damage.

Both men are right in their contention. One group of men, however, is trying to use too big guns with a horsepower of two and a half to three horsepower as the limit, with a machine which possibly is not in the best condition and with a relatively low pressure. The result is a coarse spray which does not do the business whereas the ten and twelve horsepower outfit with a gun can be made to throw a mist spray which is very thorough in the results which are accomplished.

With the improvement of machinery and compounds, there has been a return in some districts at least to dusting. The indications are that dusting

Tent caterpillars can be controlled by arsenical sprays

and spraying both have their place and that they can supplement each other in the control of certain insects and diseases very nicely.

Organization of Spraying

In the farm home orchard districts the coming of the spray ring has been a great boon. Many an orchardist who could not afford an up-to-date spray rig now has the use of this same by uniting with his neighbors and forming a spray ring. More of these rings should be formed wherever the acreage consists of many small holdings.

On the Pacific slopes much success has followed district organization. In some of the Canadian fruit growing districts certain disastrous diseases and insects have been kept out by organizing the entire community to fight them. In the Hood River Valley of Oregon at one time the dreaded fire blight started to get a foothold but by arousing the entire community and making a tree to tree inspection, this disease was actually stamped out of that valley. In the Wenatchee Valley of Washington, a remarkable success was obtained in the past by organizing the districts in their fight against the codling moth. Colorado has made much progress along such lines and in any district where there is a large acreage of fruit it should be profitable to organize district cooperation among the various growers in such a way as to get better control.

Improved Material

During the past two decades there has been a wonderful improvement in the materials which are offered to the grower for his spraying. Lime sulphur has come steadily to the front because we have not been able to find something better, not that it is entirely satisfactory but it has proved to be perhaps more of a universal spray

Leaves of the Snow-ball and other shrubs are often attacked by aphis

than anything else which we use. The dried sprays have met with increased favor. The dry arsenate of lead and the dry lime sulphur because they can easily be mixed and used, have made many friends. The arsenates which at one time were more or less questionable as regards the amount of damage which would be followed by their use are now practically harmless as far as spraying injury is concerned. The coming of spreaders in the past four or five years is a new step forward in our spraying and it is only a question of time until practically every grower will use some kind of spreader. The oil sprays have found their place. Miscible oils, Scalecide and last, the Red Engine oil are all finding their places in our spraying schedule.

The Delayed Dormant

The sprays which have come to the front in the past four or five years

The black aphis are very destructive to the cherry

Green aphis do a great deal of injury to young trees

Shot hole borers generally attack trees that are weak or diseased

have been the so-called delayed dormant and pink sprays. In the control of such diseases as scab and in destroying many of the disastrous insects and eggs, there is nothing superior to the delayed dormant and pink sprays, and more and more from the Atlantic to the Pacific more emphasis is being put on these sprays as compared to the dormant spray. As growers become to study carefully the use of the delayed dormant and pink sprays they become more enthusiastic over the results which they have secured.

Spraying Insurance

Every year a larger and larger percentage of our growers are becoming to realize that spraying, while expensive, is nevertheless very successful and is a form of insurance—just as essential as the insurance of a building against loss from fire. More and more growers are becoming to

Empty egg cases of the leaf roller

realize that the best results are obtained by following a carefully planned schedule from year to year rather than trying to make the spraying meet some special emergency. If a careful schedule is followed and if instructions given by the experts are studied diligently, there will be very rarely need for special applications. Spray to keep the pests out and to destroy them as soon as they appear rather than to drive them out after they have become thoroughly entrenched. Ask the most up-to-date growers today what their rules are on spraying and they will say, "Well, first follow a definite schedule; second, buy the best outfits, machinery, etc., that you can afford, and finally, supplement your spraying with the best orchard practices, such as thinning, pruning, cultivation and maintaining a high vigor in your trees as it makes them more resistant to the majority of diseases and they are better able to stand the attacks of insects."

Our Needs

While new diseases and insects are appearing continually, after all the greatest work needed in this country today is with the well established in-

(Continued on page 50)

Spray Calender for Virginia

By G. S. Ralston, Blacksburg, Virginia

Spray Calendar for APPLES—1923

No.	Locality	Time of Application	Materials to Use	Parasites	Remarks
1.	All districts	Dormant season, preferably as soon as leaves have fallen from the trees.	Standard strength* lime-sulphur, diluted 1 to 7 or its equivalent of other strength solution.	Scale and general clean-up.	Do not wait until spring to apply this spray. It is not safe to combine sprays 1 and 2. Growth may be injured.
2.	All districts	When green tips are slightly emerged from the blossom buds.	Standard strength lime-sulphur, diluted 1 to 8. To each 50 gals. of solution add ½ pint nicotine sulphate.	For rosy aphis and to kill any scale that escaped spray No. 1 scab.	Every orchard should have this aphis spray. In addition this spray will give protection from early scab infection.
3.	All districts	When pink show well in fruit buds.	Standard strength lime-sulphur, 6 quarts to 50 gals. water. To each 50 gals. of solution add 1 lb. powdered lead arsenate.	Scab, Curculio, Tent Caterpillar and other leaf eating insects.	All varieties should receive this spray. It is one of the most important sprays. Spray the scab susceptible varieties first and resistant varieties as York and Grimes last, but spray every variety.
4.	All districts	When petals are ¾ fallen.	Same as No. 3.	Codling-moth, Curculio, Scab, etc.	All varieties should receive this spray. Important for scab control.
5.	All districts	Two weeks after No. 4.	Same as Nos. 3 and 4.	Curculio, Codling-moth, Scab, Frog Eye Leaf Spot, Black Rot.	If blotch has been prevalent, use Bordeaux in place of lime-sulphur. This is the most important Leaf spot and Blotch spray and of great importance in securing scab control.
6.	So. sections, (a) East and Middle lowlands	June 1st to June 5th.	Bordeaux Mixture, 4-5-50 formula, to which add 1 lb. powdered lead arsenate to each 50 gals. of the solution.	This spray is for Codling-moth, Scab, Bitter Rot, Leaf Spots, Blotch, Black Rot, etc.	This spray is exceedingly important. It is applied at the time the first brood Codling-moth larvae are hatching in greatest numbers. Without this spray Codling-moth or Bitter rot cannot be controlled in infested or infected orchards. Every orchard and all varieties should receive this spray treatment. It is important that Bordeaux be used at this time, since it is not so liable to burn as lime-sulphur. Further the lime-sulphur will not control Bitter rot. Any variation in time of treatment of this and other sprays will be given out in Va., through the Spray Service Organization.
	Middle Piedmont So. Highlands, (b) S. W. Virginia, Roanoke Valley	June 3rd to June 10th.			
	Northern Piedmont (c) Extreme Northern section, Valley of Va., Appalachian Highlands	June 6th to June 12th.			
7.	(a) Under 6	June 20th to June 25th.	Same as in No. 6.	This spray is for Codling-moth, Bitter and Black Rots, Leaf Spots, Cloud (Sooty fungus) Fruit Spots, and other diseases and chewing insects, as Leaf Rollers, etc.	This spray should be carefully applied. It is very important for Bitter Rot, Black rot, and is the important "cloud" spray. It is just as important that Bordeaux should be used at this time as in No. 6.
	(b) Under 6	June 22nd to June 26th.			
	(c) Under 6	June 25th to July 1st.			
8.	(a) Under 6	July 8th to July 15th.	Same as in Nos. 6 and 7.	Same parasites as in No. 7.	This spray is applied at the time the worms from the second brood moth are emerging in largest numbers.
	(b) Under 6	July 10th to July 15th.			
	(c) Under 6	July 20th to July 25th.			
9.	(a) Under 6	Aug. 5th to 10th.	Same as in Nos. 6, 7 and 8.	Same parasites as in Nos. 7 and 8.	This spray will control diseases that lower the grade of fruit in late fall, prevents break down of fruit after picking and checks the third brood Codling-moth and Leaf roller. The latter insect has caused considerable injury the past few years.
	(b) Under 6	Aug. 12th to Aug. 18th.			
	(c) Under 6	Aug. 15th to Aug. 25th.			

*Standard strength lime-sulphur tests 32 degrees Baume.

SPRAY CALENDAR FOR PEACH

No.	Time of Application	Materials to Use	Parasites
1	Dormant season	Standard strength lime-sulphur, diluted one to eight	Scale leaf curl
2	Immediately after the petals drop	One lb. powdered lead arsenate to 50 gals. water. Add 3 lbs. freshly slacked lime to each 50 gals. of solution	Curculio
3	One week after No. 2	Self-boiled lime and sulphur to which add 1 lb. powdered lead arsenate	Curculio, Scab, Brown Rot
4	Three weeks after No. 3	Same as in No. 3	Same as in No. 3
5	One month before fruit ripens	Self-boiled lime and sulphur	Scab and Brown Rot
6	For late varieties only. Three weeks after No. 5	Same as No. 5	Brown Rot

DISCUSSION OF PEACH SPRAYS

No. 1—This spray must be applied before buds begin to swell or Leaf curl will not be controlled.

No. 2—Recommended on account of increase in numbers of curculio. Sanitation in orchard and clean cultivation commencing before growth is resumed in spring will aid materially in controlling Curculio.

No. 3—Important for Curculio or early attacks of fungus diseases.

No. 4—Very important Scab and Curculio spray. Also used to control Brown rot on early varieties.

No. 5—Brown rot and Scab spray.

No. 6—Applied only on late varieties.

SPRAY CALENDAR FOR CHERRY

1.	Dormant season	Lime-sulphur, standard strength, diluted 1 to 8.	Scale and general clean-up
2.	Immediately after petals fall	Standard strength lime-sulphur. **Sour Cherry,** diluted 6 quarts to 50 gals. **Sweet Cherry,** diluted 5 qts. to 50 gals. Add 1 lb. powdered lead arsenate to each 50 gals. of solution.	Curculio and Leaf Spot.
3.	One week after No. 2.	Same as in No. 2	Same as No. 2
4.	Three weeks after No. 3	Same as in No. 3	Same as No. 3 and also Brown rot
5.	Immediately after fruit is harvested	Same as in No. 2, but omit the lead arsenate.	Leaf Spot

SPRAY CALENDAR FOR RASPBERRY AND BLACKBERRY

No.	Time of Application	Materials to Use	Parasites
1.	In spring before growth starts	Two and one-half gals. standard strength lime-sulphur in 50 gals. water.	Anthracnose, etc.
2.	When new shoots are 6 to 8 inches high	5 quarts lime-sulphur, standard strength in 50 gals. water	Same as in No. 1
3.	Just before bloom opens	Same as in No. 2	Same as in No. 1

If insects of disease other than Anthracnose appears discuss the matter with your state experiment station.

SPRAY CALENDAR FOR PLUM

1.	Dormant season	Standard strength lime-sulphur, diluted 1 to 8	Scale and general clean-up.
2.	As soon as petals fall	Standard strength lime-sulphur, 6 quarts to 50 gals. water. Add 1 lb. powdered lead arsenate to each 50 gals. solution	Curculio and Leaf spot
3.	One week after No. 2	Same as in No. 2	Curculio and Leaf spot
4.	Three weeks after No. 3	Same as in No. 2	Curculio, Leaf spot, etc.
5.	One month before fruit ripens	Self-boiled lime and sulphur	Brown rot and other fungus diseases

SPRAY CALENDAR FOR GRAPES

1.	Dormant season	Standard strength lime-sulphur, diluted 1 to 8.	General clean-up
2.	When second or third leaf shows	Bordeaux mixture, 4-5-50 formula	Anthracnose, Bitter rot, Black rot, Mildew
3.	Before blossoms open	Same as in No. 2	Same
4.	Immediately after blossoms fall	Same as in No. 2	Same
5.	Ten to fourteen days later	Same as in No. 2	Same
	Thereafter at two week intervals until within two weeks of harvest season	Same as in No. 2	Same

Discussion.—Add powdered lead arsenate at rate of 1 lb. to each 50 gallons of spray solution if chewing insects appear.

Burgundy mixture may be substituted for Bordeaux in the last spray in order to prevent discoloration of the fruit.

SPRAY SERVICE

Unfortunately the time that the parasite causes injury does not remain constant from year to year. A seasonal variation in time of parasite development of at least a week's duration may occur. The variation does not correspond with, and cannot be fully measured by the development of the host. This introduces a factor connected with time of treatment which cannot be forecasted within more than a reasonable time limit and demonstrates the annual need of accurate seasonal life history data of economic parasites. With the acquirement of such data and the use of the accumulated experience of past years as a basis of recommendation a spray service may be given.

Such a spray service is now in operation in Virginia. The spray information is sent by telegraph to the local fruit growers organizations and they disseminate it through machinery of their own development to the local growers. In operation the spray service gives number of spray, as mentioned in spray calendar, date of application, parasites involved and materials to use.

SOME REASONS WHY SPRAYS DO NOT CONTROL PARASITES

Lack of Adequate Equipment.—Many growers attempt to spray too large an acreage with one outfit. This in itself leads to causes which prevent efficient treatment. Probably 30 acres of large trees compose the maximum size unit for one large machine. The average size unit for one machine is now nearer 60 than 30 acres, some are much larger in size. Furthermore, low power outfits cannot be expected to do the work that requires high power outfits.

Time of Application.—Seemingly, it is but little understood that spray treatment is a preventative and cannot be applied as a cure after infection or injury has taken place. It apparently is forgotten that a spray to be effective must be applied immediately in advance of an attack by the parasite, thereby, killing or prohibiting the development of the disease or insect. Therefore, it should be clearly held in mind that each spray must be applied at a certain definite time, which is in advance of the attack.

The average fruit grower cannot determine the time of application and must depend upon technically trained observers to determine it for him. He must then put himself in position to follow the information furnished him, with the understanding that variations in time of treatment due to geographical location is taken into account in giving out spray service information.

The calendar for apple and peach spraying as given out is based on the seasonal information and practices of 1922 and preceding years. The date of application of each spray may be modified within certain limits in the spray service to meet seasonal conditions and if so it will be given to the growers in Virginia through their local associations.

Length of Time Required to Apply Each Spray.—It has been estimated that for effectiveness, each spray must be applied during a period of five days. Individual applications extending over a ten or fifteen day period are a common cause of failure. Furthermore, the grower cannot consistently follow the spray calendar unless he is prepared to spray the orchard in a week's time. Otherwise he loses step and instead of applying the sprays at the peak time,—in immediate advance of the attack, he applies them in between attacks of the parasites and meets with but little success.

Lack of Thoroughness.—Perhaps the greatest factor leading to poor control is lack of thoroughness of application. A fine mist like spray applied under high pressure to every susceptible part is necessary. Lack of pressure, coarse spray, the improper use of the gun, large openings in the nozzle disk combined with low pressure, too much speed and carelessness, may be mentioned as factors leading to lack of thoroughness.

Because spray drips from a tree following long range treatment with coarse spray does not necessarily indicate thoroughness. The tree should be completely sprayed at one operation and occasionally the operator should climb into a tree and see if any parts have been missed. Regardless of the time and amount of spray required, spray thoroughly or not at all.

Use of Untested Material.—It is unfortunate that many growers spray with untested lime-sulphur; in many cases the solution is entirely too weak to give control and the efforts of the grower were made in vain. The most satisfactory test of lime-sulphur is made in the tank after dilution has been made. Dilution tables may be secured from your agricultural college to guide in diluting lime-sulphur. The use of a good hydrometer is necessary to give proper test.

In addition to untested lime-sulphur the use of new materials of doubtful value or at least not fully tested must be mentioned as a risk that the conservative grower will not take.

There's a Thrill in *Playing* Music You Cannot Get From Listening

ONE thing is sure—you'd rather play music, personally, than just listen. With a Gulbransen you CAN play good music, yourself, ***just as you want to play it!***

It's easy. Instruction Rolls are provided. All the family will quickly become expert.

All the fun without long practice! All the joy without hard work! All the music that you long for, played with feeling and effect!

And here's more! The words are on the rolls. Play in any key. Pause when you will—then faster, with perfect shading. Express *yourself*, musically. There's nothing quite like it.

Your Gulbransen dealer will invite you to "play it yourself." Do so.

GULBRANSEN-DICKINSON COMPANY, *Chicago*

Canadian Distributors:
Musical Merchandise Sales Co.
79 Wellington St., West, Toronto

Send This Baby for a Baby
Also New Book of Gulbransen Music, Free
CHECK COUPON

☐ Check here if you do *not* own a piano.
☐ Check here if interested in having player action installed in your piano.

Write name and address in margin, Mail to Gulbransen-Dickinson Co., 3234 W. Chicago Avenue, Chicago, Ill.

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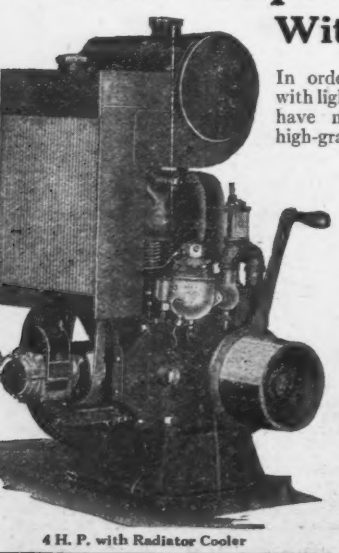
GULBRANSEN
The Player-Piano

FARM WAGONS
High or low wheels—steel or wood—wide or narrow tires. Wagon parts of all kinds. Wheels to fit any running gear. Catalog illustrated in colors free.
Electric Wheel Co., 148 Elm St., Quincy, Ill.

KINKADE GARDEN TRACTOR
and Power Lawnmower
A Practical, Proven Power Cultivator for Gardeners, Suburbanites, Truckers, Florists, Nurserymen, Fruit Growers.
American Farm Machine Co.
2534 Uni. Av. S.E., Minneapolis, Minn.

Catalog Free

Greater Capacity and Pressure
With a Lighter Engine



4 H. P. with Radiator Cooler

In order to secure greater capacity and pressure, with lighter weight, leading manufacturers of sprayers have now standardized for their power on the high-grade

Cushman

The 4 H. P. Light Weight Cushman is the proper size for the larger triplex orchard sprayers with capacities of 8 to 10 gallons per minute, at 250 to 300 lb. pressure.

The 1½ and 3 H. P. Cushman Engines handle the smaller sprayers.

The 8 H. P. Double Cylinder Light Weight Cushman is the best engine for the largest orchard and standard shade tree sprayers.

Rebuild Your Sprayer

with the famous Cushman Engine and get more power and pressure with less weight.

Write for Engine Bulletin, mentioning the sprayer you have or expect to buy.

CUSHMAN MOTOR WORKS
955 N. 21st Street LINCOLN, NEBR.

Southern California Pests

(*Continued from page 25*)

trol are involved. Fungicidal sprays are used to a limited extent. A few outbreaks of "withertip" have occured. This is a fungus, more generally known in Florida, which attacks both fruit and foliage. A reddish tear-staining results on the fruits, while the leaves and young twigs are killed outright. Spraying with a mild solution of Bordeaux (2-2-50) in the fall or early winter acts both as preventative and cure. A "Brown rot" fungus that lives most of the time in the soil often attacks the low hanging fruit on lemon trees. This works during the warm, damp weather of early winter. Spraying the trees to a heigth of four feet with Bordeaux 2-2-50 just before the rainy season commences gives satisfactory control. This is practiced quite generally by lemon growers and should be universal, except possibly in orchards on very light soil where the disease does not often appear.

The fourth group of pests and diseases comprise those which act directly upon the trunks and main branches of the trees and which require hand work in their control. The term "Gummosis" has come to stand for a specific disease attacking the trunks especially of lemon trees. Oranges are more resistant but not immune. It is caused by the same organism that is responsible for the brown rot of the fruit. Painting the trunks with Bordeaux paste, of the consistency of whitewash, is a splendid preventative of infection. A trial of this method was recently made in which every other row in an orchard was so treated. None of the treated trees became infected during the next twelve months, while 40 trees, or 2% of the untreated ones were attacked. The disease is a serious one, often killing out large patches of bark. When left unchecked it finally girdles and kills the trees. Treatment consists in cutting out the diseased bark and painting the area with Bordeaux paste.

Scaly bark of oranges is a somewhat similar disease. The name is quite descriptive of the trouble. While it is very widely distributed and sometimes attacks as many as 25% of the trees in an orchard, yet its cause is still unknown and preventative measures have not been found. Treatment consists in scraping the bark thoroughly and covering the scraped surface with Bordeaux paste, a carbolic wash, or creolineum.

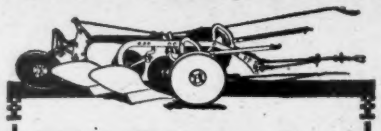
There are occasional outbreaks of other pests. Aphis sometimes do injury; a tortrix worm has been increasingly bothersome of recent years; a cottony rot fungus is injurious in certain years. The pests and diseases enumerated above, however, fill the grower's calendar full to overflowing, and he sincerely hopes that the list will never grow longer.

A Baffling Pest

(*Continued from page 27*)

best remedy that can be suggested, is to isolate the diseased trees by trenching around them. Two precautions are necessary. First, the trenches must be dug as deep as any root is found to penetrate, and second, great care must be exercised to be certain that the trench is outside of the diseased area. If a diseased root is encountered on digging the trench, this must either be followed up to its extreme limit and all the fragments of wood and bark removed and the ground thoroughly sprinkled with a five percent solution of formalin or the direction of the trench must be changed so as to go around it. It is quite possible to refill the trench with the idea of reopening it once every two years for the purpose of cutting the roots that are trying to cross. The object of the trench is to prevent the roots of healthy trees from penetrating into the diseased area. It is absolutely neces-

(*Continued on page 49*)



The Plow for Your Orchard

Under the low limbs, up close to the row, without harming branches or trunks—that's the way you want a plow to work in your orchard.

No. 45-A—the low and narrow plow

is built especially to meet your orchard-plowing requirements. Only 26 inches high when plowing 6 inches deep. Only 37 inches wide. No projections above or at either side to catch limbs or scar trunks. Adjustable hitch permits setting plow to either side of tractor for close work, throwing either to or from row.

Just the right size for small tractors. Adapted for either deep or shallow plowing. Unusual clearance. A simple, strong, long-lived plow. Tell your John Deere dealer to show it to you.

SEND TODAY for free No. 45-A booklet. Also tell us of other implements on which you want information and we will send free booklets and "Bookkeeping on the Farm," just what you need for farm accounts. Address John Deere, Moline, Ill., and ask for Package AX-61

JOHN DEERE
THE TRADE MARK OF QUALITY MADE FAMOUS BY GOOD IMPLEMENTS

"It sticks rain or shine"

Less than 1c a Tree
is the cost of applying
"SPRACEIN"
that good
Casein Spreader

and no more labor is required than spraying without it.

It spreads the spray more evenly and makes it stick much longer.

Write for free booklet

Richmond Dairy Company
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"It sticks rain or shine"

World's Best Roofing at Factory Prices

"Reo" Cluster Metal Shingles, V-Crimp, Corrugated, Standing Seam, Painted or Galvanized Roofings, Sidings, Wallboard, Paints, etc., direct to you at Rock-Bottom Factory Prices. Save money—get better quality and lasting satisfaction.

Edwards "Reo" Metal Shingles

have great durability—many customers report 15 and 20 years' service. Guaranteed fire and lightning proof.

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Get our wonderfully low prices and free samples. We sell direct to you and save you all in-between dealer's profits. Ask for Book No. 154

LOW PRICED GARAGES

Lowest prices on Ready-Made Fire-Proof Steel Garages. Set up any place. Send postal for Garage Book, showing styles.

THE EDWARDS MFG. CO.
204-254 Pike St. Cincinnati, O.

FREE Samples & Roofing Book

ACCORDING to government reports there are very heavy stocks of apples in cold storage. On December 1st the figures showed 4,356,000 barrels and 7,091,000 boxes, being an equivalent, all told, of 6,720,000 barrels. This is an increase of over a million barrels compared with the holdings a month previous, November 1st, and is about a million barrels larger than the five year average of December 1st.

IT LOOKS as though western apple growers will perhaps make their best money this year from small apples, small apples bringing relatively better prices in the east owing to their better condition. They are not so ripe and are firmer. Ordinarily it is only small apples which are exported as the English trade will pay relatively more for small apples than for large sizes. Some of the exporters of the Pacific Coast are already reporting returns which will be fully equal to those a year ago, which were very satisfactory. More apples have been shipped direct from Pacific Coast ports this year than ever before in our history and in years to come undoubtedly a still greater European business will be built up, as well as a growing business in South America and the Orient.

SENATOR Charles L. McNary, Chairman of the Agricultural Committee of the United States Senate, has been working to have the market news service extended to various points on the Pacific Coast. Formerly, this section of our country had this service but it was curtailed sometime ago. Since this section ships such a very large tonnage of fruits they are entitled to this service. Senator McNary telegraphed us as follows: "My amendment to extend market news service to Pacific Coast adopted by my subcommittee January 5th. As Chairman of committee I shall exert every effort to keep it in bill."

We want to take this occasion to congratulate Senator Charles L. McNary on the fine work he is doing. He is certainly always on the job when anything concerning the agricultural interests of this country is at stake.

NOT much change is taking place in the last sixty days in apple marketing. Prices have remained rather firm, barreled stock ranging from $3.00 to $6.50. Good Baldwins and Greenings have been bringing from $5.00 to $5.50 a barrel in most of the large markets. Mackintosh have gone up to $6.00 and some of the best growers have realized more. Barreled Delicious from Michigan have been reported to have reached as high as $6.50. Some barreled stock has been arriving in a rather poor condition, showing signs of being overripe.

The boxed fruit has been more or less demoralized because quite a large percentage of the tonnage arriving from the Coast is in an overripe condition, showing considerable decay and breakdown. This has been brought about by the unusual delay owing to the car shortage. Storage houses have been filled and when these were full there was nothing else to do with the fruit but stack it in warehouses until cars could be secured. In this condition much of the fruit has become overripe. Coupled with this, the warm summer on the Coast has meant that probably the fruit does not have quite normal keeping qualities. As far as boxed fruits is concerned, a rather unusual development is taking place in some markets like New York and Chicago and that is that there has been a rather unusually good demand for small fruit and it has brought relatively more money than some of the larger sizes. This has been due to the fact that the small fruit arrives on the eastern markets in a firmer, better condition. A larger fruit is softer and tends to break down more rapidly.

There have been very heavy exports of apples during the past thirty days. There was one steamer alone sailing from Portland, Oregon which carried 125,000 bushels of apples.

Apple buyers in the east have been somewhat discouraged over the situation but all believe that things will clear up in the relatively near future, that the fall and early winter varieties will soon be past their keeping season and that the later varieties like Newtown and Winesap will probably be firm and will hold well for spring and if they do, they should bring increased prices over the recent offering.

A FEW western cooperatives have entered the advertising field during the past thirty days. The Wenatchee-Okanogan Cooperative Federation is placing in New York in dealer and retail shops a very attractive poster containing illustrations, in natural colors, of the ten leading varieties from the Pacific Coast, these varieties being Jonathan, Winter Banana, Stayman, Grimes Golden, Delicious, Spitzenburg, Rome Beauty, Arkansas Black, Winesap and Yellow Newtown. Under each variety is written the months in which they are at their best. In the center of the poster are the eight brands used by the Federation and down in one corner is an apple calendar giving the months to use each variety in the year. The poster has an attractive blue background, the fruit is displayed against green foliage and the lettering is in red. The slogan, "A delight in every bite," accompanies it.

The Oregon Growers Cooperative Association and the Washington Packing Corporation have put on the elevated lines in Chicago a new Mistland prune poster. This has a very attractive blue background. In the foreground is a carton of prunes, with a red triangle and the letters "Mistland" in yellow. The poster emphasizes the tart-sweet character of the fruit and its superior flavor. These posters have caused considerable comment back east as they are somewhat different and are very attractive.

AS we go to press quotations on boxed apples f. o. b. are about $1.50 for extra fancy and $1.25 for fancy. At the big conventions in Chicago frequent offers were made to western Newtown growers of $1.50 f. o. b. Such offers were declined, however, as the growers feel they can get more money shipping direct from the Pacific Coast to England.

California navel oranges have been running to large sizes and the market has recently become firmer. Quotations range from $1.75 to $3.50 f. o. b. Shipments up to January 17th of navel oranges total 7,257 cars.

Florida oranges in big eastern markets are ranging in price, $2.20 to $6.75, Goldens $2.00 to $6.25 and Russets $2.35 to $5.70. Up to January 17th 6,957 cars of grapefruit and 11,482 cars of oranges have been shipped from Florida. Reports of the Florida quality are that the fruit is now running very fine.

Send Today for Full Details About

"Fruit-Fog"

The Biggest Thing in Spraying

Hayes Pump & Planter Co.
Dept. 12
Galva, Ill.

Please send me folder and full details. I have ....trees, aged...years.
Variety.....
Name.....
Address.....
Town.....
(Use margin if necessary)

FRUIT FOG is exclusively the product of Hayes Power Sprayers—the result of 300 lbs. guaranteed pressure for every model in the power line, regardless of capacity.

By many of the most successful orchardists, it is considered the **one** greatest help to greater fruit profits, for it breaks the spray solution into a veritable fog of tiny, minute particles that completely enshroud the tree and penetrate the most inaccessible places. FRUIT FOG practically guarantees

More fruit in poor years
Better fruit in good years
More profits every year

FRUIT FOG does not hit the tree—it floats upon it, goes into every hidden crack and crevice, sticks on top, side and bottom of every leaf, bud, twig and branch. All of the pressure is exerted in the nozzle in breaking the spray into tiny particles.

Our experience proves that you **must have 300 lbs. pressure** for effective spraying, and that **greater pressure** is expensive without increasing the efficiency in the least.

Low Maintenance Costs

Hayes Sprayers are long-lived, have low maintenance cost and our repair service is a particular feature. All distributors carry repairs. Hayes pumps are cast en bloc with few parts, easily accessible. Valves, cylinders and plungers are the only parts which ever need attention, and a grower can easily do his own repair work on a Hayes. No other sprayer is so simple in construction, so effective in operation.

Prices Cut to Rock Bottom

We are concentrating manufacture on a few models and have put prices at the very bottom—yet we have never before made a sprayer so high in quality. Every power sprayer from smallest to largest has the same fine workmanship, develops the same high pressure, and gives FRUIT FOG RESULTS. There is a Hayes Sprayer for every need from smallest to largest orchard.

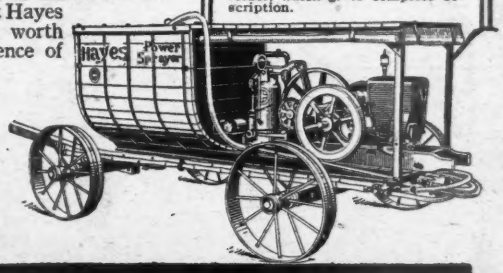
FREE **Send today for new illustrated folder—get the advice of our spraying experts**

The increasing popularity of Hayes Power Sprayers is our greatest testimonial. We could send you the names of thousands of growers who will testify that Hayes Sprayers show their real worth after the first year in absence of breakdowns.

Distributors and Dealers in all principal cities

HAYES PUMP & PLANTER COMPANY
Dept. 12 Galva, Illinois

Full line of Four-wheel Planters, Hand and Power Sprayers and Well Pumps



Hayes Boss Sprayer
A simple, long-lived compressed air sprayer, especially popular with stockmen and gardeners. Capacity, 4 gallons. Discharges with 3 or 4 pumpings.

Hayes Barrel Sprayer
Construction insures long life and high pressure. 34-inch handle gives tremendous leverage. Corrosion-proof construction.

Hayes Wheelbarrow Sprayer
Long handle gives tremendous leverage—easy to pump, easy to transport. Extra-capacity air chamber gives even, constant pressure. Capacity, 12½ gallons. Can be operated as one-man sprayer.

Hayes Platform Duplex Sprayer
The most powerful hand sprayer made. Develops high and constant pressure. For small orchards which do not need a power sprayer.

Hayes Triplex—The monarch of high pressure sprayers. There is a Hayes Power Sprayer for every need. This one proves its worth where utmost capacity and high pressure are required.

Hayes 1903 (Below)—A 150-gallon sprayer which has made a nation-wide reputation. Send for folder, which gives complete description.

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FRUIT-FOG SPRAYERS

White Light Beats Gas or Electric FREE!

Make your home bright and cheerful and SAVE ONE-HALF on oil. Tests by Government and leading Universities prove this wonderful new Aladdin is nearly five times as efficient as the best round wick flame lamps. BURNS 50 HOURS on ONE GALLON common kerosene. No odor, smoke or noise; no pumping up; easy to operate; won't explode. Won GOLD MEDAL. Guaranteed.

Try It 10 Nights FREE

Prove for yourself without risk that this remarkable white light has no equal. If not entirely satisfied, return it at our expense. $1000 REWARD will be given to anyone who shows us an oil lamp equal in every way to this new Aladdin.

Get Yours FREE

We want one user in each locality to whom we can refer customers. In that way you may get your own without cost. Be the first to write quick for 10-DAY FREE TRIAL OFFER and learn how to get one FREE.

Make Money Spare or Full Time

No previous experience necessary. Many spare time workers earning $50 per month, full time workers from $200 to $500. Our trial delivery plan makes it easy. NO MONEY NECESSARY. We start you. Samples sent for ten days' trial and GIVEN FREE when you become a distributor.

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LADIES' GOLD BRACELET WATCH FREE

EVERYBODY CAN HAVE ONE of these beautiful 7 jewel, 10 year guaranteed, gold filled Bracelet Watches.

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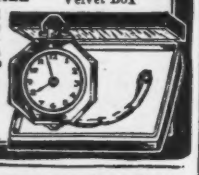
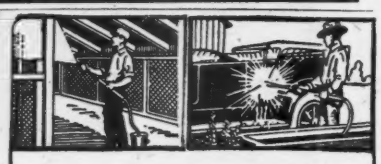


RUSH your name and address and we will send you our wonderful FREE Bracelet Watch Plan. Don't delay, write at once.

HOME SUPPLY CO. 131 Duane St., Dept. 361 New York City

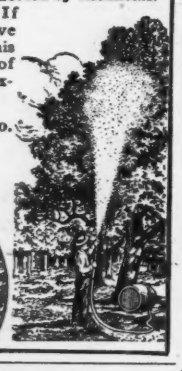


ARMSTRONG STANDARD SPRAY PUMP

The Pump of a Hundred Uses

An Every-day Necessity

THERE'S always something important for the Armstrong Standard Spray Pump to do—something that means easier work, better results. Of course, it's most important use is for spraying fruit trees and truck crops, but it is just as good for disinfecting live stock and poultry, washing the motor car, fighting fire, washing windows, etc. and is also useful as an injector in veterinary cases. Throws a stream over 30 feet high; sprays the tallest trees from the ground. Made entirely of brass—nothing to be affected by chemicals. Guaranteed 5 years If your dealer does not have it, send us $5.00 and his name. ($5.50 west of Rockies.) Knapsack extra. Send for catalog D



The Armstrong Mfg. Co. 3580 Seventh Avenue Huntington, W. Va.

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This dandy 31-inch lever action rifle is yours Postpaid for selling only 20 packages fancy Post Cards at 15 cents. IT'S EASY. Extra Prizes for promptness. Order Now. SUN MFG. CO. DEPT. 337 CHICAGO

COOKING SET GIVEN

Blue Bird Enamel Ware. 4 full-size pieces. Mixing Bowl, Pudding Pan, Kettle, Sauce Pan. Given free for selling only 30 packets Garden Seeds at 10 cents a packet. Send no money—we trust you. Write for Seeds Today.

LANCASTER COUNTY SEED CO. Station 54, PARADISE, PA.

SALE OF

WOOL Embroidered SERGE DRESSES $3.79

You won't fully appreciate this marvelous bargain until you see it—that's why we send it to you no money down. Don't miss this great offer—a chance to get a real $8.00 dress at an immense saving. Our own special model, copied from the finest dresses brought out in the style centers this season. Becoming to women of every age, it is the rage of the year.

Send No Money

Fine quality Long-wear Blue Serge. Cut with the fashionable tunic effect skirt as shown. Beautiful chain stitch wool embroidery—won't pull out or run. French knot medallions. Six silk crochet pear shape tassels on panel points. Tuxedo roll collar ending in reveres. The newest loose hanging wide flare sleeves. All around belt. Skirt is the new stylish long length. You may be proud to wear this stunning dress in any company. Order Quick. Only Limited offering. Send coupon, card or letter—no money. Pay postman $3.79 and postage on arrival as good faith deposit. If not delighted after try on, your money back without question. Sizes: Misses, 14, 16 and 18; Women's, 32 to 46 bust.

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Send Wool Embroidered Parisian Special Blue Dress at once. Will deposit $3.79 and postage with postman on arrival. I get my money back if I want it.

Size.....

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Choice of flowered Tapestry or beautiful blue Velour

Such Solid Comfort Only 20c a Day

Also Sofa and Chair to match. Made in our own great upholstering factory. 1200 other attractive Furnishings and this comfy Rocker shown in our latest, big, 104-page guide to Better Homes. All on convenient monthly payments. Let this Book help you in furnishing one or several rooms. Thousands of home-lovers have profited. Check below offer interested in.

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☐ Furnishings ☐ Symphonic Player Pianos
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Get at once our money-saving Factory-to-Family prices on these attractive Furnishings and Musical Instruments.

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Chats with Fruit Grower's Wife

By Hazel Bursell

Tests of a Healthy Person

WHAT makes a healthy person look healthy? What characteristics make you say to yourself—"that person certainly looks well and strong?"

Color is one of the first things you notice. The skin should have a "healthy glow" and look alive. A sallow, chalky appearance is a sure indication of poor health. The lack of color may be due to too few red corpuscles in the blood—anemia—and such cases should come under the doctor's care.

Lips Should not be Fiery Red

The lips should be neither pale nor fiery red, but should have a good deep pink color. The whites of the eyes are white in a well person, not yellowish or blood-shot. Finger nails tell the story too—pink nails mean health, yellow ones ill-health.

A healthy person is almost always the possessor of a cheerful, happy disposition. He or she has a joyous interested outlook on life.

The mention of interest brings us to another point. He is not only interested, but the interest shows in his expression. His eyes are bright. He is intelligent and alert looking, and possesses a quick active brain. Then too, the healthy person is not listless and tired most of the time. He will tire, of course, but he is not easily fatigued.

Must Have Normal Weight

The healthy person is normal in weight for his or her height. It will vary with individuals, but should be within reasonable limits. The person is not over weight until he begins to be obese, at 15 to 20 percent above the normal weight. Being underweight is as bad or worse than being overweight, as far as health is concerned, especially in the case of children. The flesh should be firm, and not flabby to be healthy growth.

No child is healthy unless he is growing at a normal rate. He must make a regular, steady gain from month to month and from year to year. This point is a very important one to notice.

Other indications of health are a good appetite, glossy hair, and an erect posture. Bad posture usually goes with poor health.

Mother is Responsible

The mother is responsible for the health of her family, and these few suggestions should help her to check up on her household. If some of them fail to measure up under several of the tests, it would most certainly pay to find out what the trouble is, and remedy it if possible. The healthy person with his vitality and vim has a much greater chance of amounting to something in the world than does his sick brother. Have you done all in your power to put your children in the healthy class?

Choosing the Sick Room

ONE of the first things to consider in selecting the sick room is its location as to nearness to the bath room, the view, and the relation to the other rooms. Don't however move the patient for a short illness.

The sick room should be as near to the bath as possible, as many steps will be saved. If the mother is the nurse it should be convenient to her as she works, but if there will be annoying noises and odors, in this case, it should be farther away. Whispering, rustling, squeaking, dripping of water, are all annoying to the sick, and should be eliminated as far as possible.

Need Air and Sunlight

Then plenty of air and sunlight is a factor in selection. The room should have more than one window and these should be opened, together with the door several times a day. If necessary put a screen around the patient. The correct temperature for the sick room is from 65 to 68 degrees, but the room may be warmed before giving a bath. For pneumonia or tuberculosis the room should be kept very cool.

An eastern or southern exposure is best. Keep the shades up unless the eyes are affected, and have the bed near the window. Artificial light should come from the back or from behind a screen.

To prevent draft use a window board in the window. If there is only one window it should be open both at the top and at the bottom. Don't have the bed between a window and a door, and don't have the bed in a corner where it is hard to get to it from all sides.

Have the patient arranged so that he will have an interesting view from the window—give him something to think about besides himself and his troubles. This is another reason for having the bed near the window.

Have Useful Furniture

Useless pieces of furniture should be removed from the sick room, but it need not look bare and desolate. Nothing should be in it that can not be disinfected in case of infectious diseases. The curtains should be washable.

Leave some good pictures and a few small rugs in the room. The pictures should be quiet, as action pictures are tiring.

Furniture needed in the sick room consists of a bed, a bedside table, a bureau for the patient's clothes, a straight chair for the nurse, a rocker for the patient if he is able to be up, and a screen. The screen is useful to shut out light, and drafts, and to give privacy at times. A day bed is desirable to rest the patient, and the regular bed can be made easier in that way. The best type of bed was discussed in last month's article.

Dust Regularly

The dust in the room should be collected, not scattered, using oil mops, and rags, etc. It should be done quietly and be done every day.

Flowers are all right in moderation—a few kept nice and fresh being the best plan. They should be taken from the room at night. It is well to consider the patient's desires as far as is reasonable in every case.

Hints in Renovating Woolens

ALWAYS press with a damp cloth over the garment, preferably working with the garment wrong side out. Press with a hot iron until the cloth is dry, stretching the woolen to keep out wrinkles as you work.

To remove shine—get an emery cloth from the druggist and rub the shiny spots gently with this, and then go over them with a warm silk handkerchief. Or the suit may be rubbed with a piece of flannel dipped in turpentine. Another method is to sponge with a solution of common washing blue and water, and then press while still damp under a thin cloth.

The cleaning of coat collars often proves troublesome. One good method is to use a mixture of a pint of benzine, one-half dram of chloroform, and one dram of alcohol. Apply with a soft rag, working out-of-doors, as these solvents are inflammable. The collar may also be cleaned by rubbing with a cloth dipped in ammonia. Or you may make a soft paste of ammonia and salt and employ it as a cleanser.

To raise the nap on cloth, soak in cold water for half an hour, then put on a board and rub the threadbare parts with an emery cloth.

Here is an easy way to remove wrinkles from woolen dresses, skirts or coats. Hang them in the bath-

room over the tub, close the windows and door, and turn on the hot water. Let the garment remain there for two or three hours and then hang out in the fresh air. The same treatment will remove the marks of braid from a garment.

Candle wax can be removed from woolens by the use of benzine, which can be purchased from any drug store. Care must be taken to work in the open air. If only a small spot, use a blotter under and pour on a little benzine. Then rub with the fingers, repeating this process once or twice till the spot disappears.

Another method advocated is to iron the goods between two blotting papers with a warm iron. But my experience has been that the spot will not be entirely removed in this way.

Grease spots may be removed in several ways. One is to rub the spot with cornstarch or flour and let it absorb the grease. Then brush it off and apply a new coat until all the grease has been taken up.

Soap and warm water will take out grease spots in some cases.

Benzine, chloroform, and gasoline will also remove grease spots, but the latter may leave a "ring." The work must be done in the open air, if these liquids are used.

Eat More Salads

MANY people have the idea that salads are only luxuries or fads for the rich, but this is not the case. Salads have come to have a recognized value and place of their own in the average American diet. "Everybody's Doin' it!"

And it isn't necessary to serve the salad in fancy orange or apple baskets in order to have a good nutritious salad, as they are pictured in the advertisements. The busy farmer's wife has no time for such things—but she can easily prepare just as appetizing ones, simply served on a lettuce leaf, or a bed of finely shredded cabbage. Some salads do not require even that much "dressing up." A bit of parsely is quickly added and is often all the decoration needed.

Combinations Endless

Almost any good food products will make appetizing salads when properly combined with other things. There are endless kinds of combinations—fruit, fish, poultry, nuts, meat, and vegetables—and they offer unlimited possibilities to the housewife.

Few, if any, better ways of using left-overs exist than in salads. Don't stick to any set recipe, but try out all kinds of foods and combinations. Things taste best when the family is unable to tell just what did go into their making—that is providing it is properly seasoned. Some housewives fix several kinds of salads from different left overs for the same meal, and give each member of the family a chance to take his or her favorite.

Salads are a most excellent means of adding a touch of color to a meal, and they offer big possibilities for the carrying out of a color scheme.

Some Good Orange Recipes

THIS month we are giving a set of recipes for delicious orange dishes, which will prove especially popular with the states in which oranges are raised.

In reading the suggestions given below we should not forget that there are many ways of serving the orange fresh, without any "frills." They may be served in halves, or whole with the lid taken off to be eaten with a fork. An orange is attractive served in sections joined by a band of the bright orange peel, or in sections alone on a plate. They may be peeled and served in thin round slices. Oranges are delicious served sliced with cocoanut and sugar.

Prune and Orange Salad

Dried prunes — Fresh oranges

Soak the prunes till soft, remove the pits, and cut in small pieces. Cut the oranges in small pieces. Serve on a lettuce leaf with mayonnaise. Sprinkle with nuts.

Orange Salad

Orange — Walnuts
Dates

Cut up the fruits and nuts, leaving the orange in nice sections. Mix them together with a little salad dressing, and serve on a lettuce leaf bed. Use 1 tablespoon mayonnaise on top and garnish with a walnut half.

Orange Fruit Cup

¾ tablespoon powdered sugar
½ teaspoon chopped mint
1 teaspoon lemon juice
Pulp of orange

Chill, put in frappe glass, garnish with sprig of mint.

Orange Sponge

¾ teaspoon gelatine
1½ teaspoon cold water
¼ cup orange juice
1 teaspoon lemon
2 tablespoons sugar
1 egg white

Orange Cream

1 tablespoon lemon juice
2 tablespoons orange juice
2 tablespoons sugar
1 egg yolk
1 egg white

Orange Sherbet

⅓ cup orange juice
½ tablespoon lemon juice
⅓ cup cold water
2 tablespoons syrup
1 egg white beaten stiff

Combine orange and lemon juice with syrup and water. Strain and partially freeze. Add egg white and complete freezing.

Orange Water Ice

1 quart water
2 cups sugar
2 cups orange juice
¼ cup lemon juice

Shave the yellow rind of 2 oranges and cook 3 minutes in the syrup, then prepare the ice according to the general rules.

Orange and Rhubarb

Peel oranges and throw away white part of the rind and seeds. Cut oranges into small pieces and put in kettle. Add peel cut in small strips and rhubarb and sugar. Boil until thick and stir often. To six oranges use 2 lbs. rhubarb and 1½ lbs. sugar.

Candied Orange Peel

Boil orange peel very tender, throwing away the first water. Cut into strips and weigh equal parts sugar and peel. Put on the sugar with water to cover it. When it boils, drop in the peel, and boil until clear. Rake out and roll in sugar.

Orange Salad

An orange salad is refreshing and nice for the winter months. Peel and free from all seeds and inner skins some nice tart oranges. Grate in a little of the rind if liked for a game course. Dress with salt and pepper and sprinkle with a little fresh tarragon and fine chopped chives, or shreds of fresh onions. Squeeze the juice of one orange over or use French dressing.

Orange Sauce

½ cup sugar
1 cup orange juice
1½ tablespoons lemon juice
2½ tablespoons flour
1 tablespoon butter
½ orange rind

Mix sugar and flour, add orange juice gradually. Boil 5 minutes. Remove from fire and add butter, lemon juice and orange rind.

Orange Marmalade

5 largest navel oranges
1 lemon
Discard caps of rind
Slice all the remainder very, very thin
To each pound of fruit put
3 pints of water. Let stand 24 hours
Place on stove and boil 45 minutes (Count from the time it begins to boil)
Set aside another 24 hours

Weigh carefully and to each pound of fruit and water add 1¼ lbs. sugar, (granulated) and the juice of one lemon. Boil 45 minutes, allow to cool about 5 minutes and put in glasses.

Rhubarb Marmalade

Remove peel from the quarters of eight oranges. Cook peel till soft in water enough to cover. Scrape out white parts with spoon and discard it. Cut rind in small strips with scissors. Cut oranges in small pieces, removing seeds and tough skin. Put in kettle and add 5 pounds of rhubarb cut in ½ pieces. Add small amount of water and boil ½ hour. Add 4 pounds sugar and the rind of the oranges. Cook slowly 1 hour or until thick, stirring often. Put in sterilized glasses, cool and seal.

Orange Albumen

White 1 egg
½ cup orange juice
2 tablespoons crushed ice
Syrup

Beat eggs slightly, add orange juice and strain over crushed ice. Then add syrup if necessary.

Orange Mint Cup

Juice and pulp of one orange
¾ tablespoon powdered sugar
1 teaspoon lemon juice
½ tablespoon finely chopped mint

Mix, place in sherbet cups, garnish with sprig of mint. Thoroughly chill and serve.

Note:—Pimento goes well with all fruits except pears, and it adds an attractive color note in salads.

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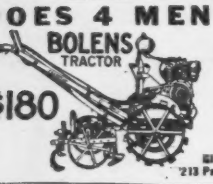

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MILLER BABY CHICKS

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Poultry Book Latest and best yet; 146 pages, 215 beautiful pictures, hatching, rearing, feeding and disease information. Big Successful Poultry Farm handling 53 pure-bred varieties and BABY CHICKS. Tells how to choose fowls, eggs, incubators, sprouters. Mailed for 10 cents.

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You will be delighted with your garden if you try my new collection of Straw-flowers. Easily grown from seed; bloom till frost—then cut and dry for winter bouquets. Everyone going wild about this flower.

For 10c I will send 5 liberal packages: Red, yellow, white, brown and pink. No better value for the money.

Guaranteed to Please

Order today, send 10c to help pay postage and packing and receive the 5 new varieties of Straw-flower and my bargain Seed Book.

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Dept. 338 Rockford, Illinois

Profit

IN FRUIT

results only from the right combination—good nursery stock, proper location, site soil and know how.

Write today for our

NEW CATALOG, FREE

On December 12, 1922, a leading horticulturist wrote us about our new catalog as follows:

"I am glad to say that the catalog strikes me as one of the very best that I have seen and represents very nearly my ideal of what a Nursery catalog should be. "The typography and illustrations are excellent and the matter plainly classified and logically arranged. The lists and descriptions of fruit varieties are conservative and reliable, and the abundant and sound information provided upon season of ripening, selection of varieties, details of soil, preparation, planting, etc., cannot fail to be of service to large numbers of inexperienced planters and much of it will be useful to the trained plant grower as well. "One can hardly escape the conviction that a firm which puts out such a conservative and helpful catalog will back up its statements with reliable goods and genuine service."

Our customers testify that we do furnish reliable goods and genuine service.

Yours-for growing satisfaction

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KELLOGG'S 1923 STRAWBERRY BOOK

Stop paying high prices for Strawberries. Write for our beautiful, big, new Strawberry Book. See how easy and profitable it is to grow your own big red berries. Book pictures in colors the many prize winning KELLOGG THOROBRED STRAWBERRY PLANTS — also describes six Kellogg

Bargain Strawberry Gardens

at Special Low Prices, from $2.85 up. Tells how thousands of families are picking Strawberries from May until snow flies, from Kellogg's Everbearing Gardens and making big cash profits besides. Also tells about the most wonderful berry ever brought out—Kellogg's

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Find out—Where it came from—Who brought it—and Why it cost $50,000. Book tells all. It's Free.

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WAGONS STEEL WHEELS

Low steel wheels (plain or grooved wide tires) make loading and hauling easier. Steel Wheels to fit any axle; carry any load. Make any wagon good as new.

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SEEDS 1923 Catalog now ready

Get this carefully planned and practical aid to garden growing. Every flower and vegetable seed that you might want for your garden is listed. Hardy perennials and ornamental shrubs for foundation planting or other decorative purpose, and fruit and shade trees, are shown in unusual abundance. Our 1200 acres have supplied professional gardeners, orchardists and nurserymen the country over for 69 years.

Catalog is complete, descriptive, interesting, free. A post card will bring it.

THE STORRS & HARRISON CO.

Nurserymen and Seedsmen

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Reliable and Full of Life

SPECIAL OFFER

Made to build New Business. A trial will make you our permanent customer.

PRIZE COLLECTION Radish, 17 Varieties, worth 15c; Lettuce, 12 Kinds, worth 15c; Tomatoes, 11 the finest, worth 20c; Turnip, 7 splendid, worth 10c; Onion, 8 best varieties, worth 15c; 10 Spring Flowering Bulbs, worth 25c—65 varieties in all; worth $1.00.

GUARANTEED TO PLEASE

Write today; mention this paper

SEND 10 CENTS

to cover postage and packing and receive this valuable collection of seeds postpaid, together with my big instructive, beautiful Seed and Plant Book, tells all about Buckbee's "Full of Life" Seeds, Plants, etc.

H.W. BUCKBEE

Rockford Seed Farms

Farm 14 Rockford, Ill.

A Baffling Pest

(*Continued from page 44*)

sary to make an exact map showing the location of the trench if it has to be reopened at a later date.

While the trench method of isolating the disease is effective, it has been found to be impractical as growers are likely to forget or neglect to reopen the trench. The only safe method of isolation is to construct the trench as above described and then to build in it a concrete wall a few inches thick. The wall should come to within 10 or 12 inches of the surface of the ground, or just so that it will not be in the way of plowing and cultivating. Treating diseased trees is possible only when the disease is discovered before it has killed more than one root. The diseased member may be removed and even though the crown of the tree has been touched, it is possible to cut out the affected part and by disinfecting the wound and covering with some good adhesive like Oronite roofing paint, reinfection will be prevented. In rare cases a tree may be attacked at the crown first. If this is discovered early, the treatment will be easy. Usually however, most of the root system of the tree is involved before the trouble is discovered. Worse still the crown may be one-half of three-quarters girdled. Under such circumstances, it is usually impossible to save the tree.

Vigilance Necessary

In regions where the disease is known to exist, eternal vigilance on the part of the fruit grower is necessary. It is easy to isolate a single tree or possibly two or three trees, but where there are already large rings formed by dead or dying trees, it becomes a matter of great expense to employ remedial measures. The only way to utilize the ground on which trees have died, is to plant garden crops, alfalfa, or replant the orchard with pears on French root, or walnuts on Northern California black walnut stock. If in a region where figs will mature, this fruit may be planted.

It must not be inferred from what has been said that all the Pacific Coast orchards are in danger or that the fruit industry as a whole is threatened, but there are individual orchards that will eventually be wiped out. In an old fruit valley in California, there is an apricot orchard of thirty acres where several centers of infection must have started about the same time several years ago. Many of the large circles have now met so that fully twenty acres are now overrun with only a tree left here and there except replants which of course will die in a few years. This is an extreme case, caused by ignorance and neglect. Where a number of trees have already died, a grower can seldom make up his mind to employ the trench and concrete wall method of treatment, not so much because of the expense involved, as because it would be necessary to abandon one tier of apparently good trees all around the circle in order to be sure of having the trench outside of the diseased area.

No reliable figures are available showing the cost of trenching and concreting. The expense of digging the trenches by hand would undoubtedly be very great, but would vary in different soils. In some soils, too, the roots penetrate much deeper than in others. The depth will vary from three to six or seven feet, depending upon whether the subsoil is clay, sand or a sandy loam. Most California fruit soils are five to eight feet deep, before clay is encountered. The use of ditching machines has been suggested instead of hand labor. But the trouble with most of these is that they are built for straight away work and not only cannot turn sharply, but the wheel base is too long for turning on a curve among trees set twenty feet apart. One professional ditch digger has built a trenching machine on an automobile chassis that would un-

The Trees Behind The Pack

NOWHERE is it more true that "Like begets like" than in the orchard. You cannot harvest No. 1 fruit from scrubby Trees of poor varieties. An orchard of healthy, well-selected Trees must stand behind the pack if you would succeed with fruit.

Some of the most successful orchards now bearing were started with Harrison Trees. They made rapid growth—proved healthy, hardy and true-to-name.

All Harrison Trees are budded directly from our own bearing orchards. They grow lustily in the bracing salt air of the Maryland Coast. The root systems mat heavily in the rich loam. Our strict grading assures you Trees of good size and satisfactory development. Our prices are low, based on immense production.

Write for Free Planters' Guide

Our 1923 Planters' Guide tells which are the best-paying varieties of Apples and Peaches and describes them in detail, also Pears, Plums, Cherries and Small Fruits. It tells, too, how we prune, spray, cultivate and fertilize in our own big commercial orchards. Besides, there are chapters on Evergreens, Shade Trees and other Ornamentals. Write for this Planters' Guide today.

If interested, also ask for Home Beautifying Suggestions.

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Box 52 Berlin, Maryland

"Largest Growers of Fruit Trees in the World"

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BALDWIN'S
Big Berry Plant Book

is enlarged to meet growing demands, handsomely illustrated, chock full of information; everbearing and standard varieties of strawberries, blackberries, raspberries, dewberries and grapes, when to plant, how to grow, for market or home use, in short, how to make a success in the berry business. **Baldwin's plants** are produced from Michigan new ground, in a soil well adapted for the purpose, under Baldwin's personal supervision, backed by thirty years experience.

This helpful and instructive fruit grower's guide tells you how to get biggest crops from standard varieties. It's a delight to have fresh fruit from your own garden. It's a satisfaction to produce fruit for commercial purposes and make the large profits that many of our customers do, **ranging from $300 to $1200 per acre.** Baldwin's plants are hardy, deep-rooted, free from disease, the vigorous kind that grow quickly, large, luscious fruit and make money for the grower.

Our Money-Back Guarantee

safeguards you against loss. Read it in the book. All plants are first-class, true to name. Freshly dug and packed to reach you in good growing condition. Baldwin's Big Berry Plant Book has special features in it not to be found in any other. Get your copy quickly. It's free. Order early and secure your choice of varieties. All orders filled in the order received.

Let us start you right. Write tonight.

O. A. D. BALDWIN

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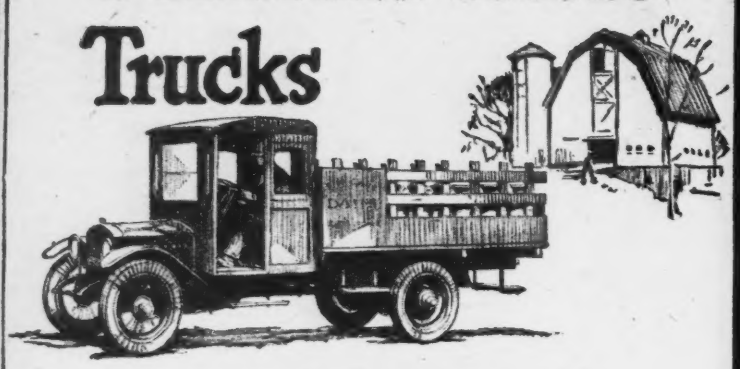

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One Ton - - - -	$1295	Three and One-Half Ton	$3600
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All prices for chassis only, f. o. b. factory, tax to be added

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PASACO SAVE PACKING COSTS ON PEACHES

7 Times as Fast as Packing in Crates

PEACHES call for speed in handling more than any other crop. They must be off the trees and under refrigeration at just the proper degree of ripeness. If you pack in crates this calls for a large crew of expert packers. PaSaCo Bushel Baskets save a large part of this expense and may save your whole crop from spoilage due to delay. Investigations show that one man can easily fill 500 PaSaCo Baskets in a day and one man can cover from 2700 to 3000 baskets per day. That's seven times as fast as crate packing.

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Our book, "PEACHES—from Orchard to Market" gives these and other valuable facts in detail. Points on picking, packing, loading and marketing of great value to any grower or shipper of peaches. Tells also how PaSaCo Baskets differ from the old style bushel baskets and why you should insist on baskets bearing the PaSaCo stamp. Write for free copy today.

PACKAGE SALES CORPORATION
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doubtedly be satisfactory for using in an orchard, but does not make them to sell (desiring to use them all in his contract work), and so far he has had too many tile drainage jobs ahead of him to become interested in trying it out in an orchard. This man takes contracts for cutting trenches five feet deep and twelve inches wide for eleven cents a running foot. With a trench wide enough to work in, it is believed that woven wire could be held in place on one wall and concrete sprayed against it with a machine made for the purpose and such a machine is now available. Perhaps more than one layer would be necessary but if a rich cement mixture were used only a very thin wall (perhaps two inches or less) would be necessary to prevent roots from crossing. This would obviate the big expense of concreting in the usual way where the big items are the wide trench, the thick wall (four to five inches) and the large amount of lumber used for the forms. The usual procedure when an orchardist discovers he has several oak fungus spots is to replant and sell the land to some stranger. This man in a few years is likely to do the same thing and so on ad finum.

New York Meeting

THE annual meeting of the New York State Horticultural Society, held in Rochester, January 10th to 12th, was the success that this meeting always is. The attendance was very large and the exhibits were the finest ever held by the Society. A very large number of manufacturers of spray material, tillage tools, automobiles, tractors, etc., put on unusually fine exhibits.

The greatest interest in the program centered around the subjects of spraying, dusting and the use of spreaders. These subjects were handled by such men as Prof. G. W. Herrick of Cornell, Prof. F. C. Stewart of Geneva and Prof. L. M. Massey of Ithaca. Pruning as handled by Dr. W. H. Chandler of Cornell was well received. The program was varied by having Dr. U. P. Hedrick tell of his recent trip to Europe and Dr. H. H. Whetzel of his year spent in Bermuda. Some attention was also given to landscape gardening, floriculture and truck gardening. One of the features of the meeting was the mass singing which was held at every session.

The officers which were elected are J. B. Pease, President, of Gasport, N. Y.; Vice-President, C. S. Wilson; 2nd Vice-President, E. W. Mitchell of Kinderhook; 3rd Vice-President, J. G. Case of Sodus; 4th Vice-President, F. J. Freestone of Interlaken; Secretary and Treasurer, Roy P. McPherson; Secretary of Permanent Fund, H. D. Fellman; Executive committee, W. Tenbroeck of Hudson; T. E. Cross of Lagrangeville; W. D. Chase of Hilton; Leslie Tanner of Medina and F. L. LaMont of Penn Yan.

Illinois Meeting

THE Illinois State Horticultural Society is always worth attending. The session this year was no exception. Great interest centered on the San Jose scale as this has been unusually bad in southern Illinois the last year. Papers by W. S. Perrine and W. P. Flint, State Entomologist, held the attention of the growers. Orchard fertility as handled by Prof. J. H. Gourley of Ohio and Dr. Henry D. Hooker, Jr. of Columbia, Mo., were subjects of great interest to the growers. Marketing by C. I. Lewis and C. E. Durst of Chicago were subjects which aroused much interest. The University of Illinois staff contributed ably to the program. Secretary W. S. Brock deserves a great deal of credit for the success of the meeting. Inspection of the new horticultural building was one of the very pleasant features of the session. Dr. W. A. Ruth, Prof. C. S. Crandall and Prof. B. S. Pickett all rendered valuable papers. Dr. John W. Roberts of Washington, D. C., handled the subject of bacterial shot hole of the peach, while Dr. R. H. Roberts of the University of Wisconsin gave one of his typical talks on pruning the young apple tree.

Better Way to Garden

Every experienced gardener knows that keeping weeds out and the surface broken up to retain the moisture is the secret of success in gardening Don't do this work a slow, back-breaking way. You can now tend garden quickly, easily—get far better results.

Barker WEEDER, MULCHER and CULTIVATOR

Simply push a BARKER along the rows (like a lawn mower)—8 blades revolving against underground knife destroy the weeds and in same operation turn the surface crust into a level, moisture-retaining mulch. Intensive cultivation. Aerate soil. "Best Weed Killer Ever Used." Has leaf guards, also shovels for deeper cultivation. A boy can run it—do more and better work than 10 men with hoes.

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Tells how to raise better gardens—eliminate hard work. Valuable book. Illustrates and describes BARKER, gives prices delivered to your station, etc. A card brings it. Write today.

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"I find the Holden surely spreads lime and fertilizer. It has been used by the whole neighborhood and farmers living seven and eight miles from here." Norman J. Hanson, Sec'y., Sparta Produce Exchange, Sparta, Wis.

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Lime and Phosphate DISTRIBUTOR

Spreads lime and fertilizer under low hanging limbs. Spreads 16½ feet wide. Spreads where the old style machine cannot go. Attaches to any wagon in three minutes. One man outfit. chain drive, light draft. Write for free folder and prices.

The HOLDEN CO., Inc.
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64 BREEDS Most Profitable pure-bred Northern raised chickens, ducks, geese, turkeys. Fowls, eggs, incubators at reduced prices. 30th year. Largest plant. Large valuable poultry book and catalog free.
R.F. NEUBERT Co., Box 838 Mankato, Minn.

Progress in Insect and Disease Control

(*Continued from page 42*)

sects and diseases. We need more support nationally and state wide to fight these pests. Money so appropriated is money well expended. Depite the fact that either lime sulphur or Bordeaux will give a reasonable control they are still far from satisfactory. What we need in this country today perhaps more than anything else is a new summer fungicide which is actually harmless, one which a grower can use with little or no danger of ever obtaining spray injury. Such mixtures will be found. The bright minds in the employ of our national government and the various state institutions can do this work if they are given the means and time with which to work. The horticultural fraternity from ocean to ocean should see that this support is rendered that we may continually make progress in fighting our insect and disease enemies.

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This Is Only the Average Size Stark Delicious Apple ⟶

They Got $5.00 a Bushel in 1922 for STARK DELICIOUS

When Other Apples Sold for $5.00 a Barrel!

THE PROOF that the public will gladly pay BIG PROFITS to growers of genuine Stark Delicious apples was apparent everywhere during the past Fall. Market experts who have investigated prices paid to fruit growers agree that 1922 clinched the truth of the claim, "It pays best to grow the best—Stark Delicious."

Look at just some of the FACTS about the tip-top market prices that Stark Delicious growers received in 1922:—

In **PENNA.** H. W. Anderson, prominent fruit grower of York Co., reports:—**"I sold my Delicious this year (1922) for $5.00 per box!** They always bring 50 to 100 per cent more every year. Other varieties sold this year for $2.00 per box."

From **MICH.,** Don E. Minor, large orchardist in Kent Co. reports:—**"Stark Delicious sell readily at double the price of the old sorts.** We have upwards of 1,000 ORIGINAL TREE Strain Stark Delicious Trees and our only regret is that we did not plant 10 times as many as we did. We have no apple that compares with it. Furthermore, **it requires no more space and overhead to produce Stark Delicious than ordinary apples and the profit returns are double."**

Dudley Palmer, N. Y., Sold His Stark Delicious For $5.00 Per Bushel When McIntosh Sold for $5.00 a Barrel.

That's the report that Dudley A. Palmer, the noted Ulster Co., **NEW YORK** orchardist made for the season of 1922. "I received $5.00 per bu. wholesale when fancy McIntosh sold for $5.00 a barrel this Fall (1922).

From up in **MINN.,** D. C. Webster, the Houston County orchardist who has won so many Apple Show Prizes with his Stark Delicious, reports:—"Stark Delicious, borne by ORIGINAL TREE Strain Stark Delicious Trees, bring me the HIGHEST PRICES of all my apples. I call them the 'Aristocrats of the Apple Kingdom'."

And from **NEW JERSEY** E. S. Marlott, Prop. Port Murray Fruit Farm, one of the Warren Co.'s largest fruit growers, reports:—"Stark Delicious is selling for the highest prices this year (1922) of any apple we are producing. The demand exceeds the supply and is increasing every year. People insist on getting Stark Delicious."

However, remember, these big-price-reports apply to the apples borne by the

-$- Salesmen Wanted Good Pay Weekly Write us TO-DAY

ORIGINAL TREE Strain of ⟶ Stark Delicious ←Sold ONLY By STARK BROS.

"We Sold All Our Stark Delicious in 1922 for $4.00 per Bushel!"

"We have had great success with Stark Delicious grown on ORIGINAL TREE STRAIN Stark Delicious Trees," reports R. W. Dunn, Pres., the big Indian Hills Orchard Co. of **MICH.** "When we purchased 1200 acres, we were told that Stark Delicious could not be grown so far North. Nevertheless, we planted quite heavily to Stark Delicious and now have 1500 trees of this variety. Wish **now** that we had planted ⅔ of the entire acreage to ORIGINAL TREE Strain of Stark Delicious. **We sold all our Stark Delicious for $4.00 per bushel in 1922!** —and a big apple broker is very anxious to get our entire crop of Stark Delicious next year."

We can't tell half the BIG PROFIT FACTS in this ad. SEND YOUR NAME AND ADDRESS ON THE COUPON—or a post card—for FREE COPY of our Big, 1923, 80-Page, 4-Color "Prize Fruits" Book! It will tell you, too, about

—R. W. DUNN, President Indian Hills Orchard, Michigan.

Stark's Golden Delicious

Bore at 2-Yrs. Old in Maine After Most Trying Winter in 40 Years

H. A. Richardson, a fruit-grower of Cumberland Co., **MAINE,** reports:—"When I planted Stark's Golden Delicious they were 1-year-old whips. Last year, one of them, at 2 years of age, bore 2 apples. **This year, in spite of having to withstand two of the most trying winters in 40 years of Maine's history, it bore 14 apples!** The fruit has exceedingly rich and colorful flavor—superior to Grimes Golden."

This greatest of all yellow apples averages about **50-percent larger than Grimes Golden**—immeasurably better than Grimes Golden in flavor and far superior to it in keeping quality—**keeps 4 months longer.** Its crisp, tender, creamy-yellow flesh is blessed with a spicy, aromatic flavor savoring of a particularly fine, perfectly ripe pear—completely **saturated** with exquisite spicy-honey juice. Firm. Very Late Keeper.

From over in **NEW JERSEY,** in Burlington Co., Chas. Riedenbaker writes: "The best apple grown." He ought to know for **ALL** his 250 Stark's Golden Delicious in their third summer bore big crops this year (1922). One yielded 80 big apples. Many bore when only 18 months old. "Very large and fine color," says Mr. Riedenbaker. You are sure to be keenly interested in the startling facts regarding this remarkable tree and apple. Get them all—SEND COUPON for FREE copy of big, 80-Page, 1923 "Prize Fruits" Book.

STARK VEGETABLE AND FLOWER SEED

Stark "Blight-Resister" Tomatoes Defied Worst Drought in 44 Years!

"I was wonderfully pleased with Stark's "Blight Resister" (improved Norton) Tomato Seed. The fruit is not only very fine and smooth, but—**After the Worst Drought We Have Had In 44 Years, 50 Per Cent of My "Blight Resister" tomato plants are still alive, still thriving, bearing abundantly,"** reports W. S. Dorn, Blaser, Little Rock, **Ark.**

SEND COUPON for FREE COPY of our Big 64-Page 1923 Seed Book.

Address Box 389

Stark Bro's Nurseries

Oldest in America — Largest in World

at LOUISIANA, MO. For Over 107 Years

Stark Bro's Prize Fruits & Trees
3-Year Old Stark's Golden Delicious Tree
1923 Catalogue of Stark Seeds and Fruit Trees
Stark's "BLIGHT-RESISTER" TOMATO
A.F.G. 2-23

2 BIG BOOKS and 5 Seeds FREE

SEND THE COUPON TO-DAY

5 SEEDS FREE
Stark's "Blight-Resister" Tomato
—the most sensational tomato ever introduced—resists wilt and blight—send Coupon for 5 seeds. **FREE**

STARK BRO'S, Box 389, LOUISIANA, MO.
Send me at once FREE Copies of 1923 Catalogs marked with X in squares below:
☐ Big 80-Page, 4-Color, 1923 Edition of "Prize Fruits," Trees and Ornamental Trees, Shrubs, Hedge and Rose Book—FREE
☐ Big 4-Color, 64-Page Stark Seed Catalog—FREE
☐ Details of Landscape Plans FREE to Customers
Put X in this square if you want 5 FREE SEEDS of Stark's "Blight Resister" Tomato

I may plant..... Trees this Spring
(State Number and Kind)

Name.....

St. or R. R. No.....

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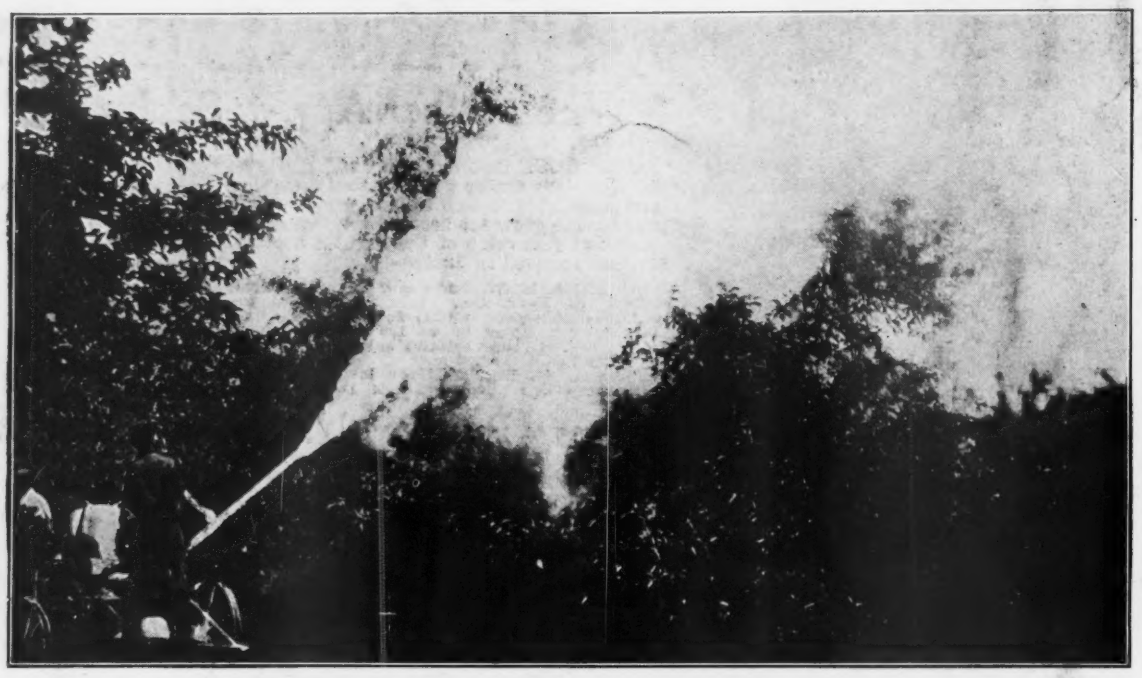

Niagara
DUSTERS and DUST MIXTURES

Envelop Trees or Plants in a Dust Cloud Reaching All Parts of Foliage

THE effectiveness of fungicide and insecticide depends upon when and how you apply it. The big thing in favor of Dusting is that you can cover a large acreage thoroughly and quickly at the critical time and do it with less wear and tear on men, horses and outfit.

WITH this Niagara, two men and one team can easily cover 5 acres of mature apple trees in one hour, do it early in the morning, after a rain, or over rough or soggy ground, and under conditions where a spray-rig would mire. ***This all means real protection***

Look at Dusting as a Business Proposition—

A Niagara Orchard Power Duster costs 1-3 less and weighs about 1-3 as much as a spray outfit; has 1-3 the wearing parts thus greatly reducing the chance of delay from breakdowns; requires less gas to run, and lasts longer.

Everything Considered Dusting Costs About 25% Less than Spraying

For while Dusting materials cost a trifle more than materials for liquid spraying, this is more than counterbalanced by the big saving in time and labor, less cost of the duster, and much smaller depreciation, repairs, and operating cost.

CUT THIS OUT, SIGN AND MAIL TO

Niagara Sprayer Co.
Middleport, N.Y.

Send me your free books on the subjects I have checked (X) below:

- ☐ **General Catalog.**
- ☐ **Potato Dusting.**
- ☐ **Pear Psylla.**
- ☐ **When and How to Dust.** (For Fruit and Crops)
- ☐ **Niagara Soluble Sulphur Compound.** (For Spraying or Dusting)

Name_____

Address_____

_____

A. F. 2

Dusting differs from spraying chiefly in that

the Insecticides and Fungicides are applied in a powdered form; dry instead of wet. Water merely carries the active ingredients to the plant, where it evaporates and leaves a dry powder. Spraying requires 50 lbs. of water to carry 1 lb. of poison to the foliage. In dusting, air is the carrier; it is ever present and does not have to be pumped and carried. The chemicals used are fundamentally the same with either method.

It will pay you to ***mark and send the coupon today*** and find out just what model duster and what Dusts are best to use on Apples, Peaches, Pears, Potatoes, Hops, Grapes, Strawberries, Celery, Small Fruits, Vegetables, etc.

Niagara SPRAYER COMPANY

Middleport, New York

Pioneer Manufacturers of Dusting Machines and Dusting Materials, Soluble Sulphur Compounds

IMPLEMENT DEALERS: Write for Our Plan

NIAGARA POWER POTATO DUSTER

Dusts 4 acres an hour. Duster made of aluminum and operated by 5-h.p. water cooled Collis motor on sturdy 2-wheel cart. Drop platform and 4-inch flexible metal discharge pipe for orchard dusting. Weight, 1,028 lbs.

NIAGARA ORCHARD DUSTER

5-h.p. water cooled Collis motor, and special orchard wagon. Sold separately. Aluminum Dust machine, highest development by pioneer duster makers. Fitted with patent flexible metal hose. Weighs 1,000 lbs., complete. Crop attachment for dusting potatoes, etc., can be supplied.

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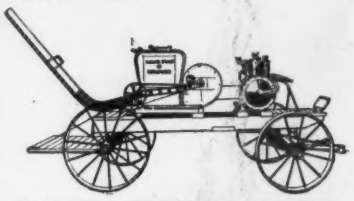

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